SOLAR ELECTRIC

KOSTAL

EN

Smart connections.

User Manual

PIKO-Inverter

3.0 | 3.6 | 4.2 | 5.5 | 8.3 | 10.1

LEGAL NOTICE

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Software version above FW: 3.75 UI: 3.71

Contents

Thank you for choosing a solar inverter PIKO from KOSTAL Solar Electric GmbH!

We hope you enjoy consistently high energy yields with the PIKO inverter and your photovoltaic system.

If you have any technical questions, please call our service hotline: +49 761 477 44 - 222

1 Notes on this manual

Read this manual carefully in its entirety. It contains important information on the installation and operation of the inverter. Pay particular attention to the instructions regarding safe usage. KOSTAL assumes no liability for damages arising from the non-observance of this manual.

This manual is an integral part of the product. It only applies to solar inverters PIKO from KOSTAL Solar Electric GmbH. Retain this manual and pass it onto the new owner in the event of a new operating company.

The installer as well as the user must always have access to this manual and must be familiar with its contents, particularly the safety instructions.

Target groups

This manual, especially chapters 5 (‹Installation›) and 6 (‹Commissioning and de-commissioning›), are intended for **specialist tradespersons**. Information relevant for the **operator** can be found in chapters 7 (‹Inverter operating characteristics›) and 8 (‹System monitoring›).

The inverters described in this manual differ from one another in terms of particular technical details. Information and instructions, which only apply to certain device types are indicated accordingly, for example "PIKO 4.2/5.5".

Information concerning your safety or that of the unit is highlighted especially.

⚠ DANGER

Non-observance of safety warnings, which are identified by the signal word DANGER, can cause fatal injuries.

⚠ WARNING

Non-observance of safety warnings, which are identified by the signal word WARNING, can cause serious and/or permanent injuries.

⚠ CAUTION

Non-observance of safety warnings, which are identified by the signal word CAUTION, can cause minor and/or reversible injuries.

ATTENTION

Non-observance of safety warnings, which are identified by the signal word ATTENTION, can cause damage to property.

2 Proper use

The PIKO inverter converts DC current into symmetric, single-phase (PIKO 3.0/3.6) or 3-phase (PIKO 4.2/5.5/8.3/10.1) AC current and feeds this into the public mains grid. The unit may only be used in grid-connected photovoltaic systems within the permissible power range and under the permissible environmental conditions. The unit is not intended for mobile use.

Inappropriate use can be hazardous and lead to injury or even death of the user or third parties. Material damage to the unit and other equipment can also occur. The inverter may therefore only be used for its intended purpose.

Exclusion of liability

Any use that differs from or goes beyond the stated intended purpose is considered inappropriate. The manufacturer accepts no liability for any damage resulting from this. Modifications to the inverter are prohibited. The inverter may only be used if safe to operate and in technically perfect condition. Any instance of misuse will cause the termination of the warranty, guarantee and general liability of the manufacturer.

Only a qualified electrician may open the unit. The inverter must be installed by an electrician who is responsible for observing the applicable norms and regulations. Work that could affect the electrical power system of the respective utility company at the site of the solar energy feed-in may only be carried out by qualified electricians expressly authorised (licensed) by the utility company.

This includes changes to the factory preset parameters. The installer must always observe the regulations of the utility company. The utility company's specifications must always be observed when setting the parameters, since otherwise the ENS (grid monitoring) will no longer function correctly.

3 Safety instructions

Improper handling during installation and while operating inverters can cause potentially fatal situations due to electrical shock.

Furthermore, non-observance of this manual could cause burns or even fires due to the potentially high surface temperature of the cooling elements.

Therefore always observe all safety instructions in this manual.

Safety markings

The labels and markings attached to the housing by the manufacturer may not be changed or removed.

Proper installation

The installer must be familiar with and observe all local installation regulations valid in their respective country.

The installer must be familiar with this manual and follow all instructions.

Lightning protection

The lightning protection for the inverter depends on whether the building or photovoltaic system is equipped with an external lightning arrester.

If the building has been provided with an external lightning arrester, overvoltage protection type 2 is mandatory on the AC and DC side, and must be installed on-site.

If the building has **not** been provided with an external lightning arrester, we recommend the installation of overvoltage protection type 2 on-site on the AC- and DC side.

We also recommend the installation of overvoltage protection for communication lines (RJ45, RS485, sensors...). When several inverters are connected, overvoltage protection must be installed on both ends of the cable.

Electromagnetic fields

Danger due to electromagnetic fields!
People with pacemakers, metallic implants or hearing aids may experience complications. Such people should consult their doctor before entering a site with inverters.

Opening the unit

Only a qualified electrician may open and perform work on the unit.

Fatal voltages are produced in the inverter during operation.

- Switch off the unit completely (DC side and AC side) before all work.
- Wait at least five minutes after switching off until the condensers have discharged.

Disconnecting cables

Burns from arcs!
Cables must never be removed from the device during operation as dangerous arcs may form. First de-energise the DC side, then remove plug-in connectors!

Disconnecting the DC side on units with a DC-load break switch

The DC load break switch is not an isolation switch for complete disconnection. The inverter is isolated from the PV generator only when the plug-in connectors are disconnected.

It is possible to plug in and to disconnect the plug-in connectors under voltage – but not while under electrical load.

Touching the inverter during operation

Individual housing sections, especially the cooling elements, can reach temperatures of over 80 °C during operation.

- Do not touch hot components.
- Allow the device to cool down before maintenance work.

Avoiding risk of fire

Individual housing sections, especially the cooling elements, can reach temperatures of over 80 °C during operation.

- Comply with regulations when choosing the installation site.
- Always keep the ventilation openings clear.
- Do not obstruct the unit.
- Do not store combustible and flammable materials near the inverter.

4 Unit and system description

Function

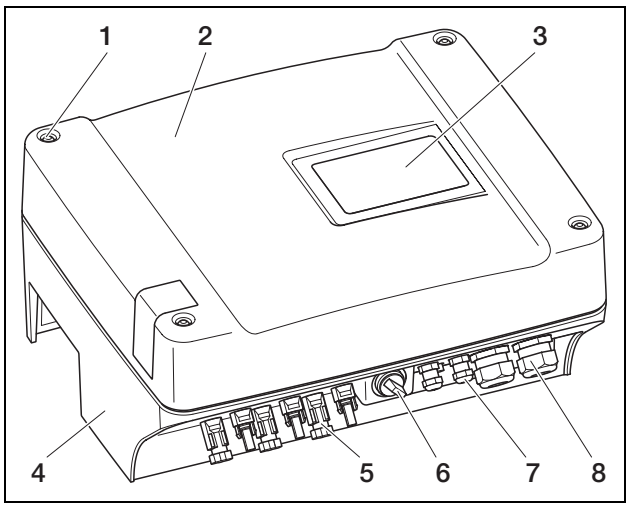


Fig. 1: *Inverter* PIKO

1 Screws
2 Cover
3 Display
4 Housing
5 Plug-in connector or cable openings to connect the solar modules
6 DC load break switch
7 Cable openings for optional communication
8 Opening for the mains cable

PIKO solar inverters are powerful and transformerless string inverters. They convert the DC current produced by photovoltaic modules into symmetric, single-phase (PIKO 3.0/3.6) or 3-phase (PIKO 4.2/5.5/8.3/10.1) AC current and feed this into the public mains grid. Power generation independent of the public grid ("island operation") is not possible.

Through three-phase technology, PIKO 4.2/5.5/8.3/10.1 combine the stability and durability of large central inverters with the high efficiency of transformerless string inverters.

The single-phase inverters PIKO 3.0/3.6 use the modern and fail-safe phase-shifting procedure to monitor the grid.

To improve efficiency, PIKO 4.2/5.5/8.3/10.1 use only one or two phases with a limited power input (less than 10 percent of the rated power) for feeding current into the grid. The device selects the phase on a random basis each time.

The PIKO inverters are fitted with an integrated DC load break switch. No external break switch is therefore required. The solar modules are connected to the inverter via plug-in connectors.

The PIKO inverters are available in various output sizes (see table 16, page 53) and offer you maximum flexibility in configuring your solar energy system. This is achieved through a broad DC input voltage range, independent MPP regulators for each input, which enable the connection of solar modules in various combinations (alignment, inclination, quantity, type). In order to conveniently display the yields and production data of your photovoltaic system, the inverter has an integrated web server, see chapter 6.2.1.

Note: There are currently inverters available with two different communication PCBs (communication boards), clearly visible from a small display on communication board I and from a large display on communication board II.

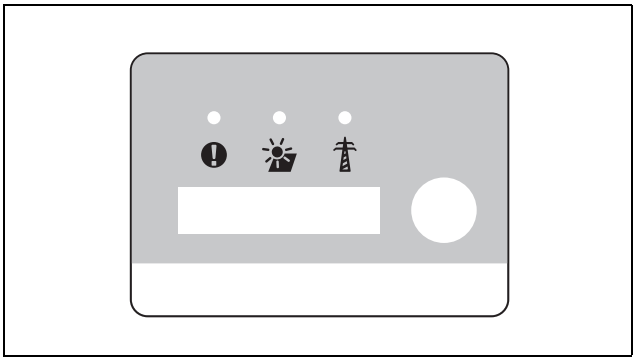


Fig. 2: *Small display on inverter with communication board I*

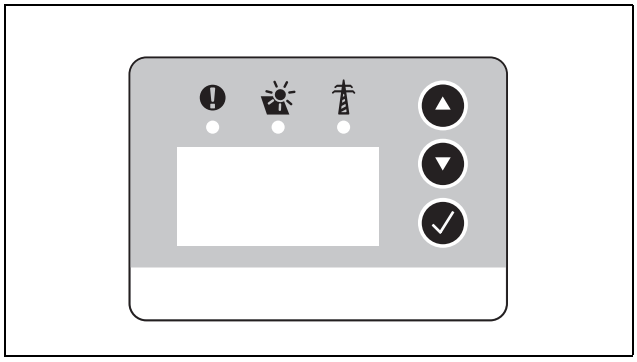


Fig. 3: *Large display on inverter with communication board II*

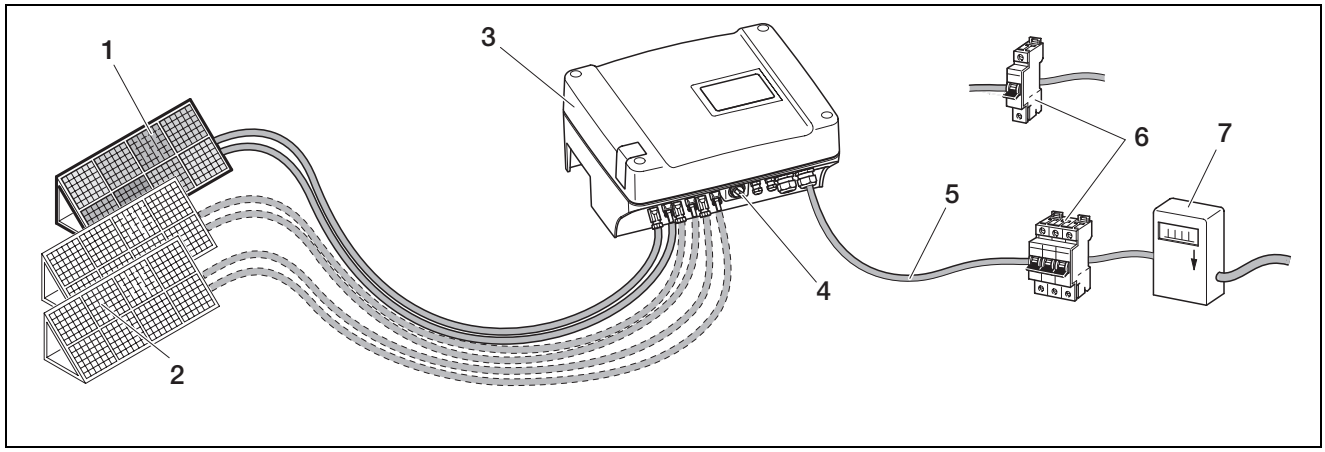


Fig. 4: *System illustration of a grid-connected photovoltaic system*

1 PV string 1
2 PV string 2 and 3 (optional)
3 Inverter
4 Electronic DC load break switch
5 AC mains cable
6 *Single-phase or 3-phase AC line circuit breaker (for layout, see table* 1*, page* 13*)*
7 Feed meter

Inputs

The PIKO operates using the so-called string principle: In this system, a limited number of solar modules (depending on the desired power output while considering the maximum permissible input voltage) are connected in series as a string, which is then connected to the inverter. The number of strings depends on the configuration of the solar energy system.

The strings are connected to the inverter via plug-in connectors.

Depending on the unit type, one, two or three separately controllable inputs are available. Inputs one and two can sometimes be connected in parallel in order to allow a higher input current (see table 2, page 14). For PIKO 5.5, parallel connection is not possible.

You can obtain the highest yields through the maximum permissible input voltage. This is achieved by using the smallest possible number of inputs with identical power. An example: For the installation of 48 solar modules, it is better to use two inputs with 24 modules each rather than three inputs with 16 modules each.

Be sure to always observe the specifications on the type plate!

Internal consumption

Instead of feeding the electricity generated by the PIKO inverter into the grid, you can also use some or all of it yourself. Using a control signal that the inverter emits via a switch output (relay), electrical devices can be automatically switched on via an external load relay as soon as sufficient power is available. On the inverter, you can set the minimum power that must be available before the devices are switched on.

This internal consumption option is ideal for devices which are only needed when the sun is shining (such as air conditioning systems) or those which can wait until bright sunshine is present (washing machines and dryers). In addition, internal consumption reduces the load on the public electricity grid.

Note for systems installed in Germany: You can claim a special internal consumption payment as defined in EEC 2009 (section 33 para. 2) for electricity that you can demonstrate to have used yourself. This applies to systems of up to 30 kW which did not go online before 1 January 2009.

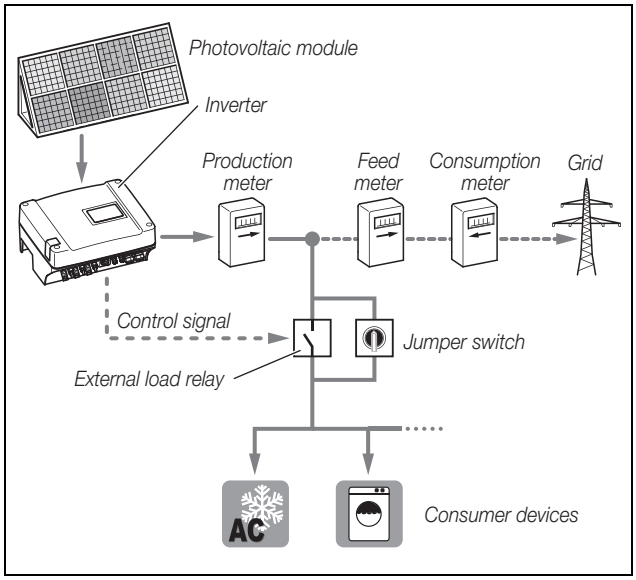


Fig. 5: *Internal consumption (example illustration: connecting the devices and recording the internal electricity consumption is the operator's responsibility)*

Active power control

Note: The information in this section applies only to systems in Germany.

On the basis of the renewable energy law (EEG) introduced in Germany on the 1.1.2009, grid operators may temporarily limit the output of feed-in systems with an output of 100 kW or more ("power reduction"). This helps protect the grid from overloading and avoid grid failure.

The ripple control receiver required for this, which is provided by the grid operator, can be connected to the PIKO inverter. The information received in this way can be relayed by the inverter to the other inverters in the system via an Ethernet- or RS485 network.

Note: If your photovoltaic system has an output of less than 100 kW, active power control is, of course, not required.

In addition, in accordance with the German Federal Electricity Association BDEW's regulations for the connection and parallel operation of power-generating units on the medium-voltage grid dated June 2008 ("Medium-voltage regulations"), the PIKO inverters, can *depending on frequency*, limit the power fed to the grid.

This form of power restriction may also be necessary for systems connected to the *low-voltage grid* if your connection to the public grid accesses the medium-voltage mains.

The installer makes the appropriate settings – after consultation with the local grid operator – during installation; see chapter 5.5.

Reactive power control

Note: The information in this section applies only to systems in Germany.

In accordance with the German Federal Electricity Association BDEW's medium-voltage regulations, since April 2011 grid operators can demand the feed-in of inductive or capacitive reactive power with a displacement factor of 0.95.

The PIKO inverters are designed so that they can be used to control reactive power.

The installer sets the parameters required by the local grid operator during installation, see chapter 5.5.

You can get further information on this from our service hotline (+49 761 477 44 - 222).

Transport and storage

The function if the inverter has been tested and it has been carefully packed prior to delivery. Upon delivery, check that the delivery is complete and check for any possible transport damage. Complaints and damage claims are to be directly addressed to the shipping company.

ATTENTION

Risk of damage when the inverter is placed on its underside.

- Always place the inverter on its rear side (cooling elements) after unpacking.

If stored for a longer period before installation, all components of the inverter must be kept dry and dust-free in the original packaging.

Scope of delivery

The packaging contains:

— 1 inverter (*1*)
— 1 wall mount (not for replacement devices) (*2*)
— 1 GD containing operating instructions (*3*)
— 1 poly bag with:
  – 2 sealing caps (3-pole, 5-pole) for sealing the AC terminal with lead (mandatory in Italy) (*4*)
  – Installation accessories: 4 screws DIN 571 A2 6×45,
    4 dowels with 8 mm diameters and 40 mm in length,
    1 tapping screw DIN 7516 form A galvanised M4x10) (*5*)
  – 2 wire jumpers for parallel connection (not possible on all units) (*6*)
  – Plug seals for the screw connection for the network cable (*7*)
  – 2 insulating caps (*8*)
— Poly bag each with (number of poly bags corresponding to string inputs):
  – 2 counterparts for plug-in connectors (*9*) (1 × plug, 1 × socket)

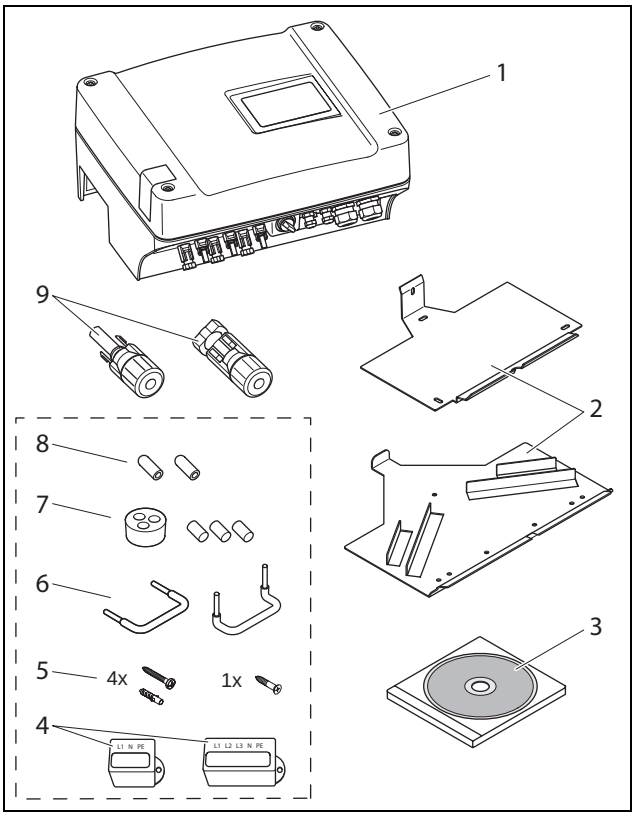


Fig. 6: *Scope of delivery*

5 Installation

⚠ DANGER

Risk of death due to electrical shock!

When performing any work on the inverter and feed cables:

- Switch off the voltage on the AC and DC sides of the unit.
- Secure the voltage supply from being unintentionally switched back on.
- Wait at least five minutes until the condensers of the inverter have discharged.
- Check the device and cables to make certain that they are voltage-free.
- Prior to installation, check whether the local mains grid and the power output of the photovoltaic modules are compatible with the technical data of the inverter. Observe the type plate.
- Observe the specified sequence of installation tasks: Install the inverter first, then connect it to the electricity supply.
- Observe the VDE safety regulations, all national regulations in the country of use as well as the connection and safety regulations of the local energy supplier.
- Pay attention to careful and correct installation: No dirt, no foreign bodies and no moisture may enter the inverter.

5.1 Installation

⚠ DANGER

Risk of death due to improperly performed installation!

Improper installation can lead to life-threatening situations. The inverter and the components connected to it can also be damaged, increasing the risk of fire.

Selecting the installation site

You can install the inverter indoors as well as outdoors. The ideal installation site is as dry and cool as possible (such as a cellar or the non-sunny side of the building). Avoid direct sunlight since the inverter capacity is reduced at high temperatures. For outdoor installation, the inverter should be protected from direct rainfall by a projecting roof or canopy.

The inverter must be installed in a permanent location. It is not intended for mobile use.

Observe the following conditions when selecting the installation site:

– Do not install the inverter near highly flammable materials or in areas at risk of explosion.

- The cooling fins of the inverter can reach temperatures of over 80 °C during operation. Select an adequately heat-insulated base that cannot ignite at the above mentioned temperatures. Maintain adequate safety clearance from flammable materials in the surroundings.
- The base must be of sufficient stability to bear the weight of the inverter. Plasterboard walls and wooden planks are not suitable for the base!
- The inverter is intended for vertical installation on a wall. The unit can be tilted no more than 10° to the left or right and no more than 60° backwards. The unit may not be tilted forwards or installed in a horizontal position.
- The ambient temperature must be between -20 °C and +60 °C.
  The air humidity must always be between 0 % and 95 % (non-condensing).
- In order to ensure adequate cooling, a clearance of at least 200 mm must be maintained above and below the inverter. On the left and right sides there must be a clearance of at least 100 mm (see illustration 7, page 11).
- Leave enough room on the side of the unit in order to be able to disassemble the fan for maintenance work, if necessary.
- If the inverter is installed in an enclosed area, (for example in a switch cabinet or small room), use a forced ventilation system to ensure that the hot air is properly dissipated.
- The inverter should be accessible for any subsequent work. The LEDs, the display and the type plate should be visible and easy to read.
- Install the inverter in a place where children for example cannot pull out the cables by accident. In areas where there is risk of flooding, the unit should be installed at an adequate height.
- Bear in mind that the inverter may produce noise during operation, which may be considered annoying in living quarters.

Installing the wall mount and hanging the inverter

- Mark the positions of the drill holes at the installation site by using the wall mount as a drilling template.

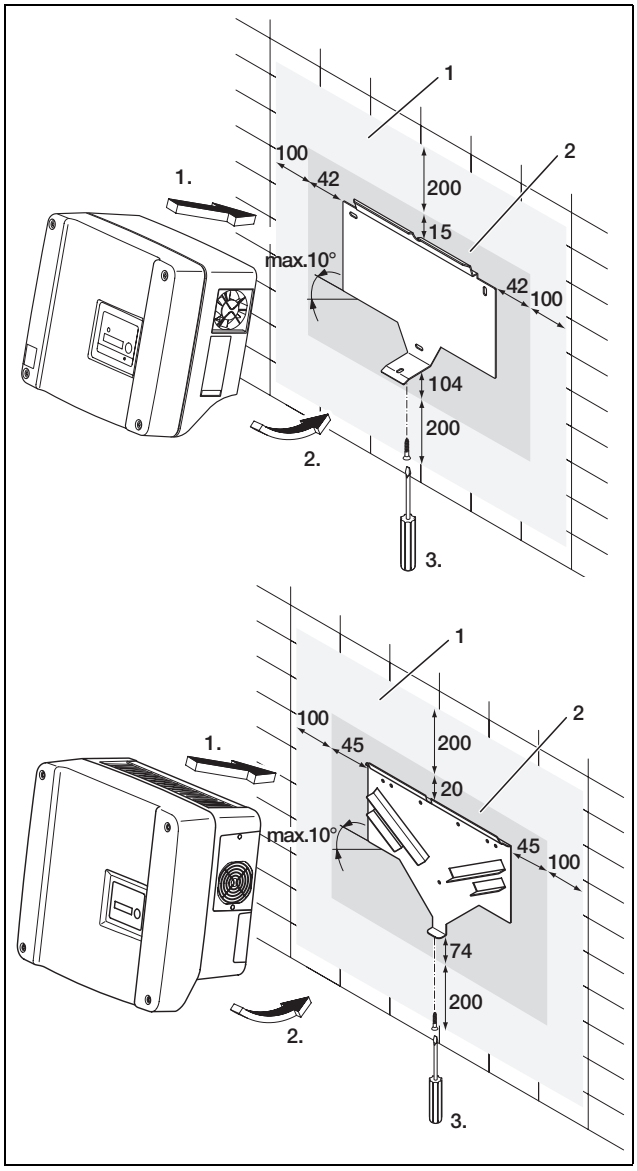


Fig. 7: *Installing the inverter (top:* PIKO *3.0/3.6/4.2/5.5, bottom:* PIKO *8.3/10.1)*

1 Required space for cooling
2 Outer dimensions of the inverter

- Drill holes and insert wall anchors if necessary.
- Screw the wall mount to the intended surface. Use the supplied screws.
- Hang the inverter on the wall mount.
- Fasten the inverter on the underside using the supplied screw.

5.2 Electrical connection

⚠ DANGER

Risk of death due to electrical shock!

If exposed, voltage-carrying cables make contact, an electrical arc can occur, posing a life-threatening hazard.

- Only remove as much of the cable insulation as is necessary. The insulation must reach up to the terminal.

⚠ DANGER

Risk of death due to electrical shock!

Metal slivers can fall into the inverter when removing the insulation. Contact with voltage-carrying components during operation can cause an electrical arc to occur, posing a life-threatening hazard.

- Never remove the cable insulation above the inverter!

Opening the housing

- Release the four screws of the cover and carefully remove the cover.

5.3 Connecting the AC side

- Unscrew the cable screw connection for the mains cable (1 in figure 8).

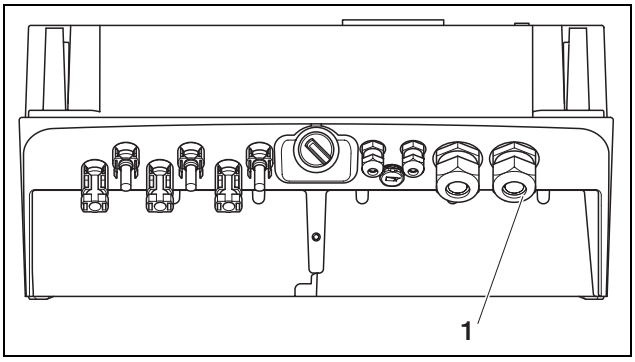


Fig. 8: *Connections on the housing*

1 Cable screw connection for mains cable

- Press the blind plug and the sealing ring out of the screw connection **from the inside towards the outside** using a screwdriver or similar implement. Detach the sealing ring from the blind plug.

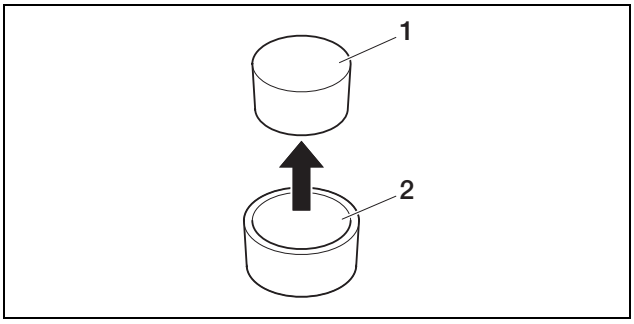


Fig. 9: *Pressing the blind plug out of the sealing ring*

1 Blind plug
2 Sealing ring

We recommend a mains cable of type NYM-J 5×2.5 (for single-phase connection NYM-J 3×2.5). The outer diameter of the cable can be 9…17 mm, the cross-section of the individual conductors can be a max. of 4 mm^2 for flexible cables and a max. of 6 mm^2 for rigid cables. The three-phase feed-in to the mains means that the currents are lower than single-phase feed-in, allowing the cable cross-section to be smaller. For flexible cables, we recommend using core end sleeves.

- Remove the sheath and the insulation of the mains cable as much as needed.
- First thread the unscrewed union nut (4 in illustration 10) and then the sealing ring (3 in illustration 10) over the cable.
- Guide the mains cable through the cable duct into the interior of the inverter.
- Thread the sealing cap (illustration 11) over the mains cable. The sealing cap is mandatory in Italy.

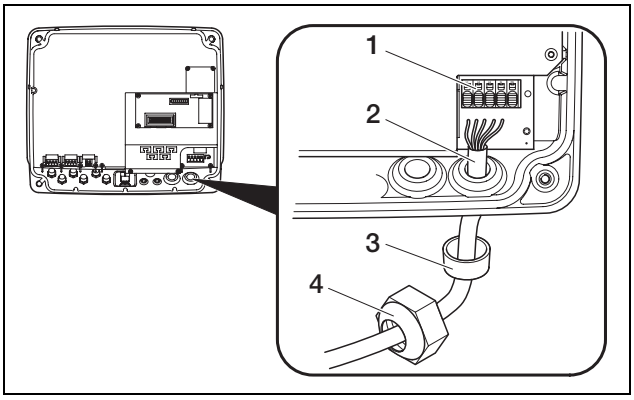


Fig. 10: *Laying the mains cable*

1 AC terminal (5-pole; for PIKO *3.0/3.6: 3-pole)*
2 Mains cable
3 Sealing ring
4 Union nut

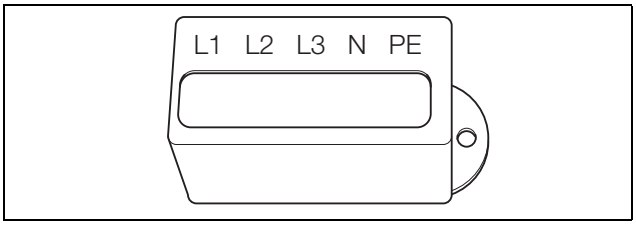


Fig. 11: *Sealing cap for AC terminal*

Note: To connect the AC and DC cables, the inverter is equipped with spring-loaded terminal strips (figure 12).

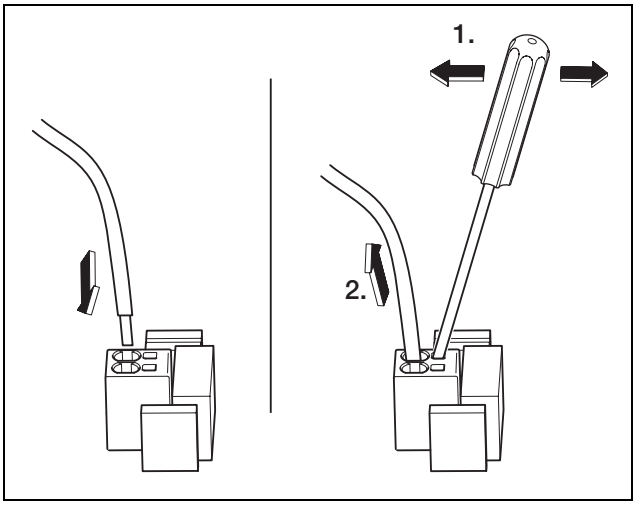


Fig. 12: *Spring-loaded terminal strip: Fastening the cable (left), detaching the cable (right)*

- Connect the conductors of the mains cable to the AC terminal in accordance with the labelling (figure 13).

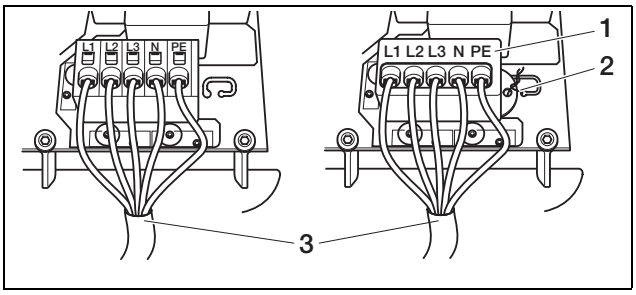


Fig. 13: *Mains cable connected (left without sealing cap, right with sealing cap (illustration shows* PIKO *8.3/10.1)*

1 Sealing cap
2 Sealing wire
3 Mains cable

- Place the sealing cap on the terminal block and attach the seal. The sealing cap is mandatory in Italy.
- Screw the union nut with inner sealing ring and plug tightly onto the cable screw connection.

Note: The cable connection seals the housing against moisture and also relieves tension on the cable to ensure it is not pulled out of the terminals by its own weight.

- Check whether all lines are securely connected and cannot become loose.
- Switch off the current distributor and secure the voltage supply from being unintentionally switched back on. Ensure that the current distributor is de-energised.
- Lay the mains cable from the inverter to the current distributor.
- **WARNING! Risk of fire due to overcurrent and heating of the mains cable.** Install a line circuit breaker into the mains cable between the inverter and the feed meter (see table 1) to secure it against overcurrent.

	PIKO		
	3.0 3.6	4.2 5.5 8.3	10.1
Type	Single-pole	Three-pole	
Tripping characteristic	B		
Rated current	25 A	16 A	25 A

Table 1: *Recommended AC line circuit breaker*

- Do **not** switch on the voltage yet.

5.4 Connecting the DC side

The number of strings to be connected depends on the configuration of the photovoltaic system. First connect string 1, then strings 2 and 3 (if present).

The cross-section of the DC cables should be as large as possible, a maximum of 4 mm^2 for flexible cables and 6 mm^2 for rigid cables.

The cross-section of the DC cables must be 4–6 mm^2. We recommend using tin-plated cables. If non-tin-plated cables are used, the copper strands may oxidise as a result of which the transition resistance of the crimp connections will be too high.

If the rated current of a string is higher than the permitted input value of the inverter, you can, on certain unit types, connect the DC inputs 1 and 2 in parallel (see table 2). Two bridges have been added to the units for this purpose (figure 14).

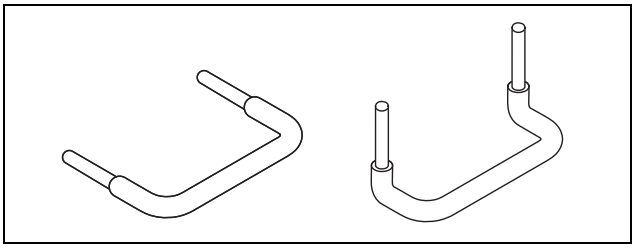


Fig. 14: *DC bridges*

	PIKO					
	3.0	3.6	4.2	5.5	8.3	10.1
Number of DC inputs	1	2	2	3	2	3
Nominal DC current per input	8 A	8 A	8 A	8 A	11.5 A	11.5 A
Max. DC input current per input	9 A	9 A	9 A	9 A	12.5 A	12.5 A
Is parallel connection of inputs 1 & 2 possible?	No	Yes	Yes	No	Yes	Yes
DC nominal current for parallel connection 1 & 2	—	12 A	12 A	—	20 A	23 A
Max. DC input current for parallel connection input 1 & 2	—	13 A	13 A	—	25 A	25 A

Table 2: *Connecting inputs in parallel*

When supplied, the inverter is equipped with plug-in connectors from Multi-Contact (type MC4) or from Lumberg (type LC4).

During assembly, always observe the **latest specifications from the manufacturer of the plug-in connectors**, e.g. regarding required special tools, permissible tightening torques etc.

Further information is available, for example online at www.multi-contact.com or at www.lumberg.com.

Installing the plugs onto the DC cables

- Ensure that the DC load break switch is set to O (OFF). The plug-in connectors may be plugged in and disconnected in this position only.
- Eliminate any existing earth faults or short circuits in the strings.
- Remove 6–7.5 mm of insulation from the DC cable. Be careful not to cut any individual conductors.
- Crimp the DC cables according to the recommendations of the plug-in connectors' manufacturer.
- Guide the crimped contacts from behind into the plug or socket insulation until they engage. Ensure that the parts matching the plug-in connector couplings are used on the inverter. Observe the polarity of the cables.
- Pull gently on the cable in order to check whether the metal part has engaged.
- Check that assembly has been carried out in accordance with the recommendations of the plug-in connectors' manufacturer.
- Hand-tighten the cable connections. The tightening torque must match the DC cable. Typical values are between 2.5 Nm and 3 Nm.

Inserting DC cables into the inverter

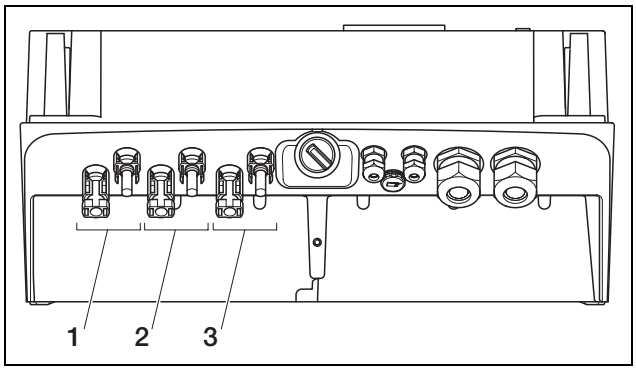


Fig. 15: *DC inputs (the number of inputs which can be used depends on the model)*

1 Plug-in connector couplings DC input 1
2 Plug-in connector couplings DC input 2
3 Plug-in connector couplings DC input 3

- Check that the inverter is de-energised.
- Set the DC load break switch to OFF.

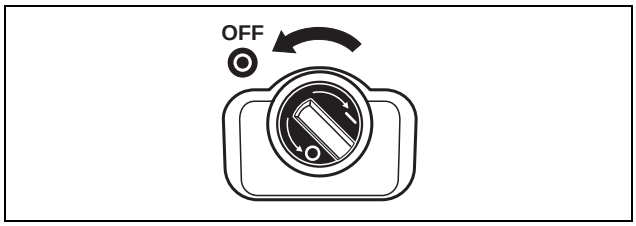


Fig. 16: *DC load break switch OFF*

- Remove the two plug seals from the plug-in connectors. Keep the plug seals.

- Insert the PV string plugs until they engage in the corresponding counterparts on the inverter (figure 17).

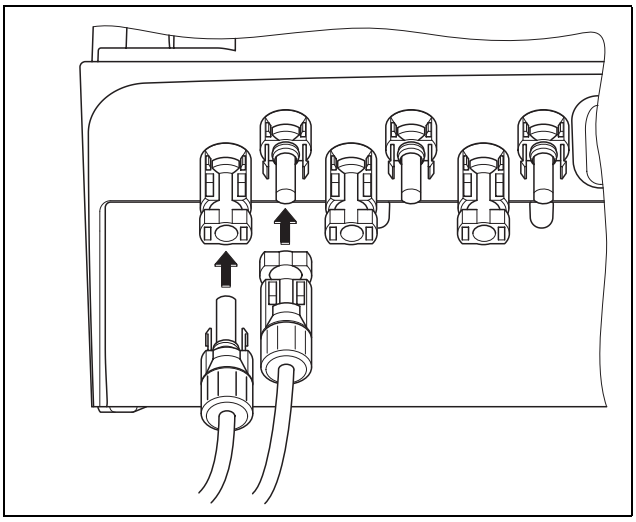


Fig. 17: *Connecting the PV string*

- Pull on the plugs in order to ensure that they are properly engaged.

Note: To disconnect the plug-in connectors, press the engaging clips together manually or with the tool available from the plug-in connectors' manufacturer and pull the plug out.

- To connect additional strings, repeat the above installation steps for each string.
  Any additional plug-in connectors needed are available from specialist shops.
- PIKO 3.6/4.2: If you connect DC input 1 and 2 in parallel, remove the cable ends of the second DC input from the clamping block DC2 and insulate the free cable ends using the caps supplied.
- PIKO 3.6/4.2/8.3/10.1: If required, now connect inputs 1 and 2 **in parallel**. Insert the bridges supplied into the clamps as shown (figure 18/19).

Note: Please note that a parallel connection is not possible with PIKO 5.5.

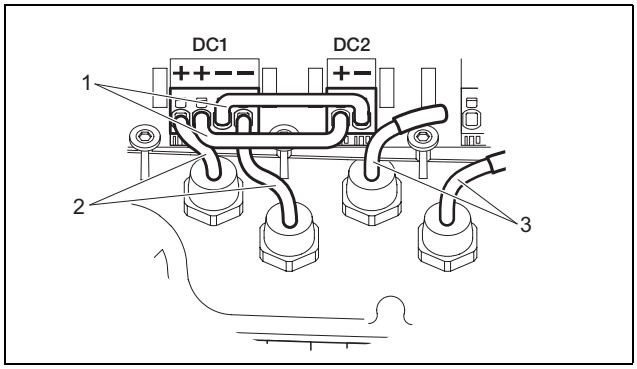


Fig. 18: *Inputs 1 and 2 connected in parallel (*PIKO *3.6/4.2)*

1 DC bridges
2 PV string 1
3 PV string 2

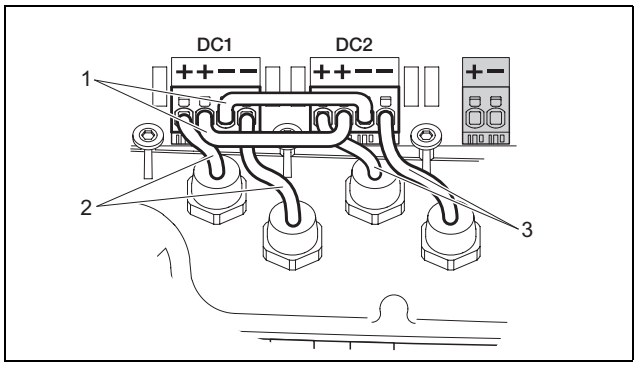


Fig. 19: *Inputs 1 and 2 connected in parallel (*PIKO *8.3/10.1)*

1 DC bridges
2 PV string 1
3 PV string 2

- Leave the plug seals on the plug-in connectors not in use to protect them from moisture and dirt.

5.5 Setting the country of use

Prior to initial commissioning, the country in which the inverter is used must be specified. This is necessary so that the grid monitoring functions appropriately for the local mains grid.

Once the AC voltage has been initially switched on, the country setting is permanently set!

If the country setting is incorrect, the inverter will not function.

In order to set the country of use, consult the chapter corresponding to your communication board.

5.5.1 Communication board I

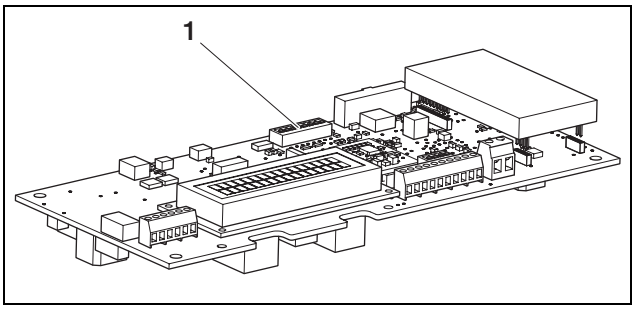


Fig. 20: *DIP switch*

1 DIP switch

The country setting is made via the DIP switch (1) on the communications board I.

Note: You can change the preset language of the display and integrated web server (see Table 3) to any selection you wish after the commissioning.

ATTENTION

The communication board may be damaged by electrostatic discharge.

- Use a blunt, non-metallic utensil to activate the DIP switch.
- Touch a grounded point, for example the holder for the housing screw connection on the bottom right, before touching the circuit board.

- Set the DIP switch as appropriate for the country of use according to table 3.

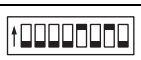
Country	Switch setting	Default language
Delivery condition (inverter deactivated)		none
Germany		German
Germany MSR		German
Including frequency-dependent power restriction in accordance with the medium-voltage regulations (MSR)		
Spain		Spanish
France		French
Portugal		Portuguese
Italy		Italian
Greece (continental)		English[1]
Greece (islands)		English[1]
The Netherlands		Dutch
Belgium		French
Luxembourg		French
Switzerland		French
Czech Republic		Czech
Austria		German
United Kingdom, Cyprus[2]		English
Hungary		Hungarian
Slovenia		English
Bulgaria Romania, Slovakia, Turkey		English

Table 3: *DIP switch settings*

1 For technical reasons, we regret that the display is unable to depict any Greek letters. We apologise for any inconvenience caused by this limitation.

2 For single-phase inverters only.

5.5.2 Communication board II

After commissioning, a prompt to select the country setting appears in the display (4).

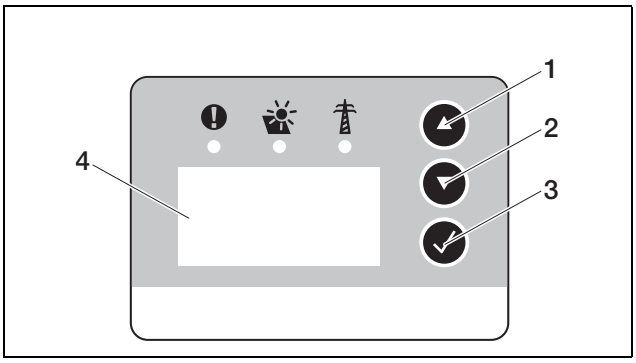


Fig. 21: *Display on the inverter*

- Press the arrow keys (1 or 2) to select the desired country.
- Press the Enter key (3) to go to the confirmation window.
- Press the arrow keys (1 or 2) to switch between "NO" and "YES".
- Press the Enter key (3) to confirm your selection.

5.6 Connecting communication components with communication board I

Now install the available communication components, such as an analogue modem, cable etc. The GSM modem is an exception, since the PIN code of the SIM card must be entered **before** the GSM modem can be installed in the inverter with the SIM card (see section 6.2.2).

⚠ DANGER

Risk of death due to electrical shock!

Single-insulated cables from communication components may come into contact with parts carrying mains voltage if the insulation is damaged.

- Only connect **double-insulated cables** to the inverter.

ATTENTION

The communication board may be damaged by electrostatic discharge.

- Touch a grounded point, for example the holder for the housing screw connection on the bottom right, before touching the circuit board.

Overview of the communications options

In terms of communication options, four different situations are taken into account.

1. Inverter configuration.
2. Direct retrieval of the current yield value and/or saved log data.
3. Transferring the yield data to an Internet solar portal.
4. Remote retrieval of the current yield value and/or saved log data.

Situation 1: Configuring the inverter

All communication settings – for example, activation of data transfer to a solar portal – are made via the integrated web server. To access the configuration on the web server, you will need a computer, which must be connected to the inverter.

The inverter is equipped with an Ethernet interface (RJ45 socket) for this purpose. The computer must also be equipped with this type of interface. The operating system is irrelevant. An Internet browser must be installed on the computer.

You can then connect the inverter and computer either

a) via a local network (switch and Ethernet cable, see figure 22), or

b) directly via a so-called crossover cable (see figure 23).

Version a) is the best option when a local network is already available. Several inverters can also be connected in the network (figure 24).
Version b) is the best option when no switch is available.

Note: Ethernet cables ("network cables") are standard connection cables commonly used for computer networks. These cables are suitable for most applications and are available from computer shops.
A crossover cable is a special type of Ethernet cable, on which the plugs are configured differently. This allows two units to be directly connected to each other without the need for a switch or hub.
You will only need a crossover cable if the inverter is connected directly to a computer, meaning without a switch/hub (figure 23).

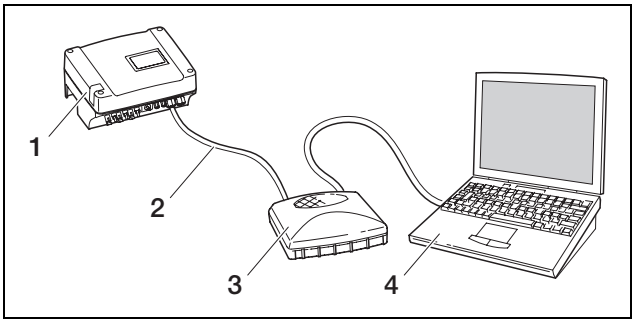


Fig. 22: *Connecting inverter and computer with Ethernet cables and switch*

1 Inverter
2 Ethernet cable
3 Switch/hub
4 Computer (for configuration or data retrieval)

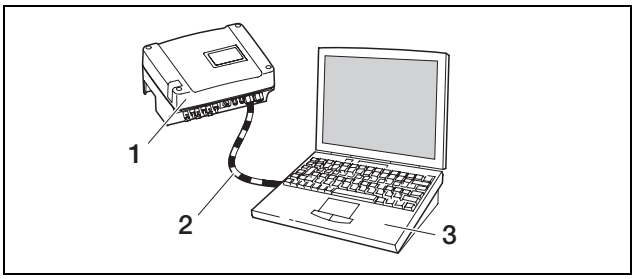


Fig. 23: *Connecting inverter and computer with crossover cable*

1 Inverter
2 Crossover cable
3 Computer (for configuration or data retrieval)

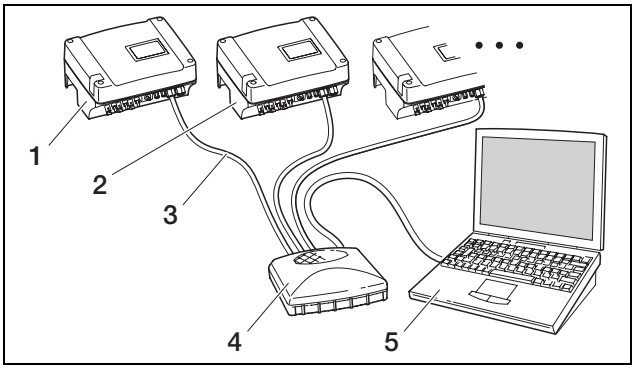


Fig. 24: *Multiple inverters in the network*

1 Inverter
2 Additional inverters
3 Ethernet cable
4 Switch/hub
5 Computer (for configuration or data retrieval)

Situation 2: Direct retrieval of the yield data

The retrieval of the current yield data as well as the stored inverter log data is also only possible using a computer. The units are cabled as described under situation 1.

Alternatively, you can connect the inverters to each other via the RS485 interface and then only need to connect one of the inverters via Ethernet (figure 25).

With this type of connection, the web server of the inverter connected via the Ethernet also displays the current output data of the other inverters. However, the web server and the stored log data are only available for the inverter connected via Ethernet.

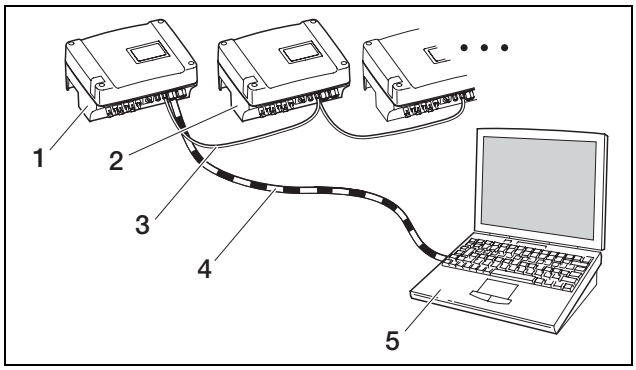


Fig. 25: *Connecting inverters via the RS485 and retrieving performance data via Ethernet*

1 Inverter
2 Additional inverters, max. 200 depending on cable length
3 RS485 connection
4 Crossover cable
5 Computer

Situation 3: Data transfer to a solar portal

The inverter can send yield data to an Internet solar portal at regular intervals.

To do so,

a) the inverter must be connected to a DSL router or to a network with Internet access or

b) the inverter must have an integrated analogue modem or wireless modem (GSM, available as an accessory).

Version a) requires a DSL connection. If your inverter is located close to where you already have a DSL connection, you can use the available connection for transmission.

Note: If the inverters are connected to the Internet by DSL router in the local network, both direct retrieval of the log data as well as transmission of the log data of all connected inverters is possible through a solar portal.

Version b) with an analogue modem requires the inverter to be connected to a separate analogue telephone connection or an analogue extension of a telecommunications system. This requires a telephone connection close by. The inverter must be connected to the telephone connection at all times.

For version b) with a wireless modem, you will require a SIM data card from a mobile phone provider. There must also be adequate wireless reception at the point of installation.

Make sure that the access point name is set correctly. To do this, use the "GSM-Link" configuration tool (see section Installing GSM modem).
A detailed description can be found on our website and the CD provided.

Note: Inadequate reception quality – for example in areas with a low network coverage – can lead to connection problems and to the GSM modem dialling into the net too often. Depending on the price model of the GSM contract, this can result in increased costs. The reception quality is also affected by the weather. We recommend testing the reception with a normal mobile telephone for a few days prior to installation to ensure that adequate reception is possible despite differing weather conditions.

Ensure that the antenna cable length does not exceed 8 m!

Note: For installations with several inverters, you will only need **one** modem.

Version b) with one or two inverters

If you have two inverters, you can connect them both with a crossover cable and equip one of the two with a modem. There is then no need for a switch or hub. The additional connection to a computer or a DSL router is not an option in this case.

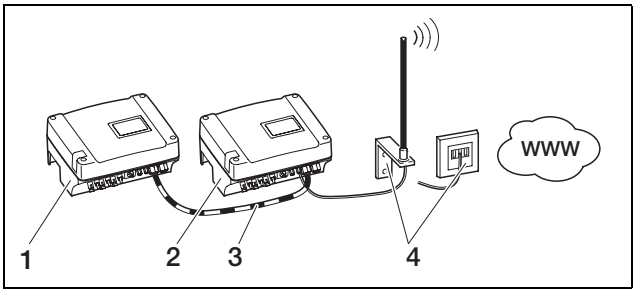


Fig. 26: *Connecting two inverters with a crossover cable, transferring data via modem*

1 Inverter (without modem)
2 Inverter with an integrated modem (analogue or GSM)
3 Crossover cable
4 Telephone connection box or mobile communications antenna (depending on the modem being used)

Version b) with two or more inverters

To transfer data from several inverters to a solar portal via modem, first connect the inverter to a switch/hub via an Ethernet cable. You will only need one modem: the inverter with the modem then assumes the function of a router for the other inverters.

The number of network connectable inverters is in principle only limited by the available IP addresses. In practice, for data transfers via GSM or analogue modem, a max. of 30 inverters can be networked, for data transfers via DSL, a max. of 300 inverters can be networked.

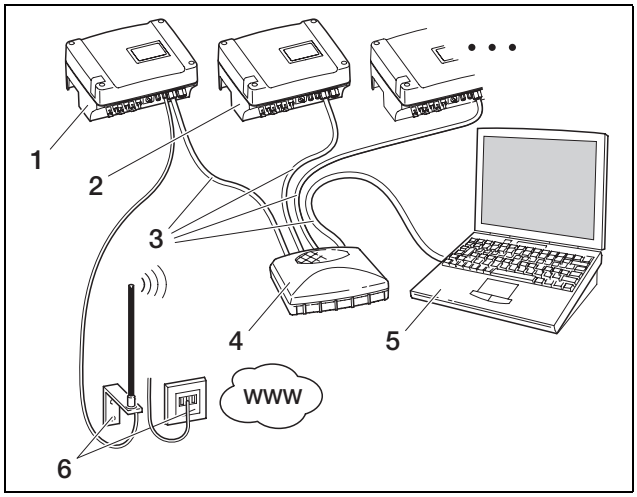


Fig. 27: *Connecting several inverters through the Ethernet and transferring data via modem*

1 Inverter with an integrated modem (analogue or GSM)
2 Additional inverters (without a modem), max. 29
3 Ethernet cable
4 Switch/hub
5 Computer (for configuration and, if applicable, direct retrieval)
6 Telephone connection box or mobile communications antenna (depending on the modem being used)

Situation 4: Remote retrieval of yield data

You can also connect to the inverter remotely instead of through a local network. This may possibly involve additional connection costs.

Similar to situation 3, the inverter must either

a) be connected to a DSL router or

b) have a modem (analogue or GSM) installed.

Version a) Inverter with DSL connection to the Internet

To ensure the inverter can actually be accessed via the Internet, several requirements must be met.

— The inverter must have a fixed IP address in the local network.

— Port forwarding must be configured to the inverter IP address in the router.

— The router must be assigned a fixed IP address by the Internet provider or you must register the router with a DynDNS service to connect the dynamic router IP address with a fixed name.
The inverter can then be accessed over the Internet under the domain name provided by the DynDNS service, and you can connect to the inverter with any Internet browser (see figure 28).

Setting up a port forwarding and a DynDNS service can not be illustrated in detail here due to the vast number of different devices and services available.

Note: DynDNS services are also referred to as "Dynamic DNS" and "DNS host service provider".
For the router to remain accessible at all times under the selected domain name, the router communicates each change of IP address to the DynDNS service. Many of the available routers offer such a function, however, a router usually only supports certain DynDNS services.
With certain router manufacturers, the port forwarding function is called "virtual server" or a similar term.
For further information, see the operating manual of the router.

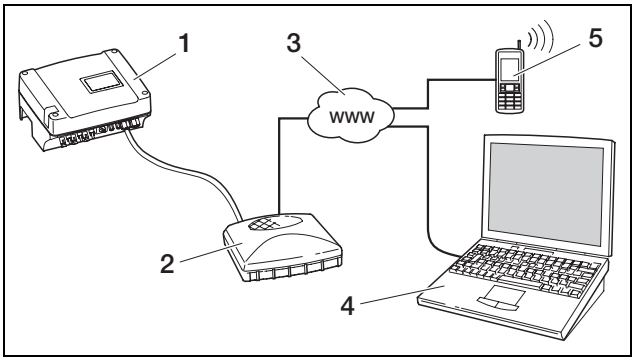


Fig. 28: *Retrieving log data: Inverter connected to the Internet via DSL*

1 Inverter
2 DSL router
3 Internet
4 Computer
5 Internet-compatible mobile phone with browser function

Version b) with an integrated modem

An inverter connected to the telephone network by an analogue modem can only be contacted by a computer when the computer establishes the connection via an analogue telephone connection or via the analogue connection of a telecommunications system (dial-in connection, see figure 29).

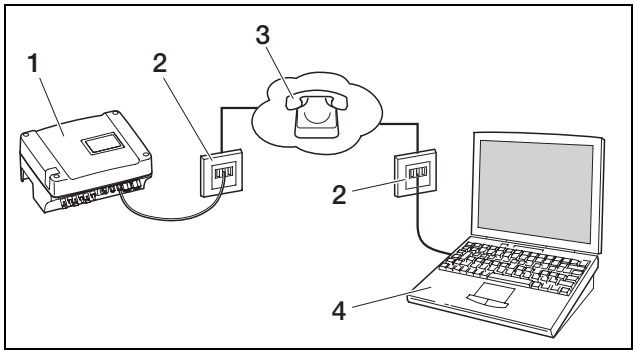


Fig. 29: *Retrieving log data: Inverter connected to a telephone network*

1 Inverter with integrated analogue modem
2 Telephone socket
3 Telephone network
4 Computer with modem

Dialling in with a computer and analogue telephone connection does not function reliably for an inverter with GSM modem. We therefore recommend dialling in via a computer with a GSM modem or a mobile telephone with a modem function (see figure 30).

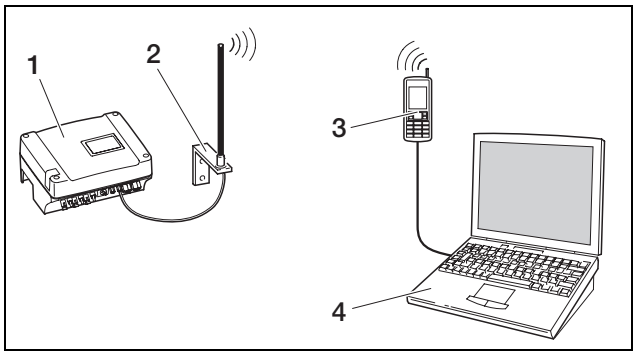


Fig. 30: *Retrieving log data: Inverter connected to a mobile communications network*

1 Inverter with integrated GSM modem
2 Mobile communications antenna
3 Mobile telephone (GSM) with modem function
4 Computer

Overview of the communications interfaces

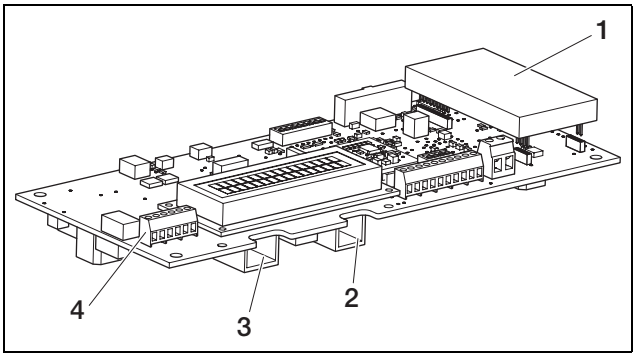


Fig. 31: *Communication interfaces*

1 Modem (accessory)
2 RJ11 socket
3 RJ45 socket
4 Terminal for RJ45 and RJ11

Connecting Ethernet cable

You can connect the inverter to a computer or a computer network (Ethernet 10BaseT, 10 MBit/s) via the RJ45 socket. Use crossover cables of category 5 (Cat 5e, FTP) with a maximum length of 100 m.

- Insert the plug of the Ethernet cable into the corresponding socket (3 figure 31).

Installing analogue modem

A prerequisite for use of an analogue modem is an analogue telephone connection. Using a modem involves additional costs. Details can be obtained from telecommunications providers.

- Carefully attach modem to circuit board. The uppermost plug pin on the left must be inserted into the uppermost hole in the multipoint connector.

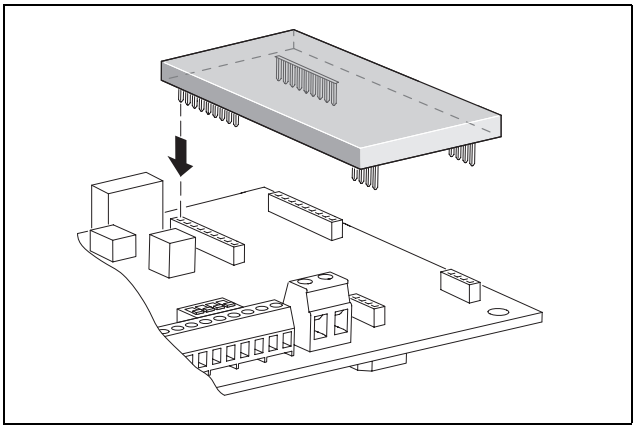


Fig. 32: *Installing the modem*

- Connect the telephone cable (see the following section).

Connecting the telephone cable

The RJ11 socket is used to connect the inverter to an analogue telephone jack or to an ISDN line with a terminal adapter. To use the RJ11 interface, you will require a modem, available as an accessory.

- Insert the plug of the telephone cable into the corresponding socket (2 figure 31).

Connecting an Ethernet cable and/or telephone line to the cable terminal

Instead of the RJ45 and RJ11 sockets, you can use the six-pole screw terminal to connect the Ethernet cable and telephone cable (4 in figure 31). This type of connection is intended for installation in large systems.

- Connect the lines to the cable terminal according to the terminal assignment (table 4).

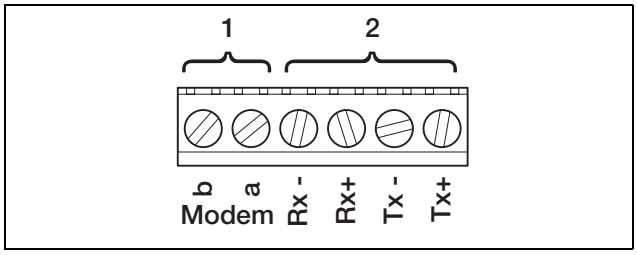


Fig. 33: *Cable terminal*

1 Analogue telephone connection
2 Ethernet connection

Terminal	Designation	Description
1	Tx+	Transmission pair +
2	Tx–	Transmission pair –
3	Rx+	Reception pair +
4	Rx–	Reception pair –
5	Modem a	Telephone line a
6	Modem b	Telephone line b

Table 4: *Cable terminal connection assignment for twisted pair cables and telephone line*

Installing GSM modem

In order to use the GSM modem, you will need a SIM data card with a contract with a mobile phone provider. The GSM-Link software leaves you free to select your mobile phone provider. Using a modem involves additional costs. Details can be obtained from telecommunications providers.

Not every mobile phone contract is suitable for use with an inverter service request.
Before purchasing the SIM data card, discuss the following points with your mobile phone provider and obtain all the access data you require (APN, user name and password).

— You should select a provider whose network supplies the strongest GSM signal at your chosen location.
— The tariff must allow for packet data communication via GPRS.
— Prepaid cards which are topped up by mobile calls are not suitable.
— Tariffs which specify particular times for data downloads cannot be used.
— The tariff must permit a data volume of at least 5MB per month and inverter.
— It must be possible for the data settings (APN etc.) to be configured by hand.
— The SIM card must be activated before installation.

- Download the "GSM-Link" software from our website www.kostal-solar-electric.com from the "Service => Download" area or use the CD supplied.
- Switch the inverter off for **at least 5 minutes**.

Fatal voltages are produced in the inverter during operation. Only a qualified electrician may open and perform work on the unit.

•Open the cover.

- Connect an Ethernet cable to the communication board (RJ45 interface (network connection)) and connect to the PC. If connecting directly (inverter with PC – without switch), you must use a crossover cable.
- Switch the inverter back on again.
- Enter the serial number, inverter name or IP address in the Internet browser's address line to go to the inverter's web server (e.g. s081230001 or s90342IE100001 or 192.168.1.1).
- Enter the PIN number on the "Settings" page in the "GSM PIN" field.

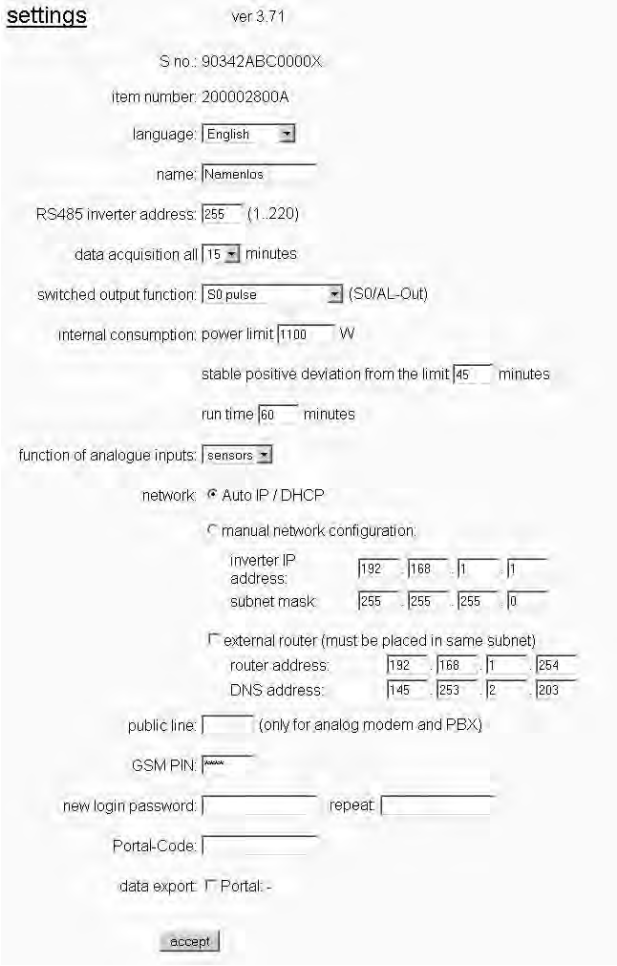


Fig. 34: *Settings page*

- Launch the "GSM-Link" software.

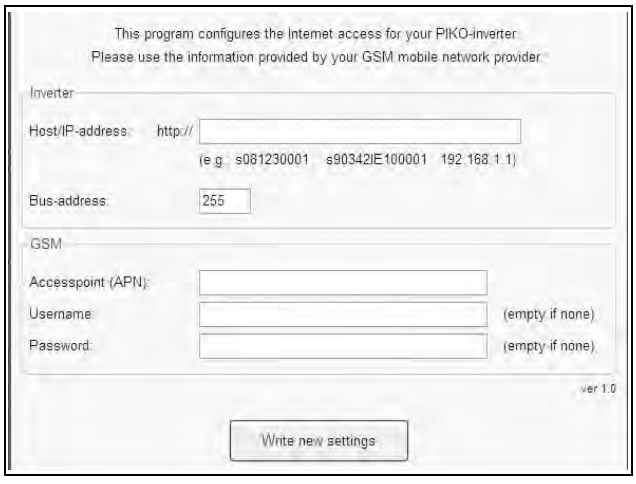


Fig. 35: *GSM-Link*

- Enter the serial number or IP address of the inverter in the "Host/IP address" field (note: enter the letter S and the inverter's serial number, for example http://S12345FD323456.)

- In the GSM area, enter the data (APN, user name and password) of the SIM card in the corresponding fields and confirm by selecting "Write new settings".
- Switch the inverter off for **at least 5 minutes**.
- Slide the SIM card into the card holder on the underside of the modem.
- Carefully attach GSM modem to circuit board. The uppermost plug pin on the left must be inserted into the uppermost hole in the multipoint connector.

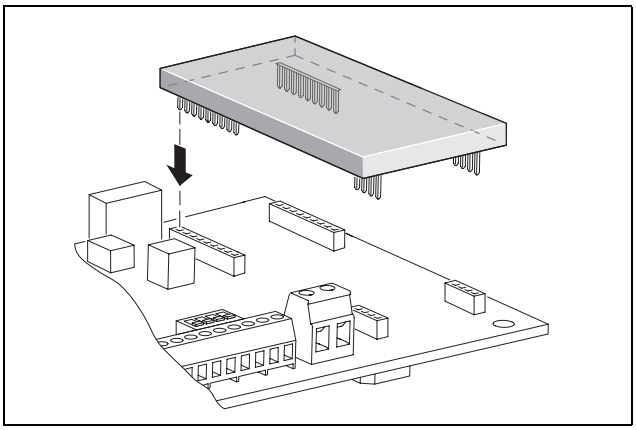


Fig. 36: *Installing the modem*

- Insert the plug of the radio antenna into the GSM modem.
- Install the radio antenna where it will have the best possible reception.
  Note: The reception quality will be displayed on the web server info page after starting up (see section ‹Checking sensors and modem› in chapter 6.2).
- Switch the inverter on again and wait at least 2 minutes.
- Enter the serial number, inverter name or IP address in the Internet browser's address line to go to the inverter's web server.
- Check the current modem status on the "Info page"

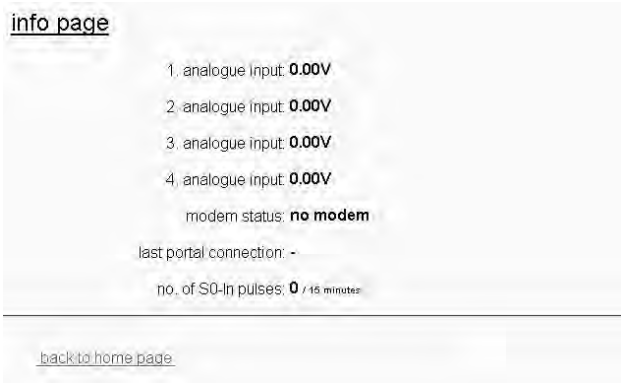


Fig. 37: *Modem status*

- If the "Modem status: GSM signal strength" field is displaying at least two bars, the connection is OK.

Activating data transfer to a solar portal

The factory default setting does not include a solar portal. To use a solar portal, you will need a portal code. You can get further information on this from our service hotline (+49 761 477 44 - 222).

Only the name of **one** solar portal will be displayed. It is not possible to use several portals at the same time.

- Open the web server's "Settings" page (see illustration 34).
- Enter the code for the intended solar portal in the "Portal-Code" field.

The portal code for Piko-control is P3421.
The portal code for safer‘Sun (www.meteocontrol.com) is P202L.

- Click on "adopt" to save the settings.
  - ➜ The name of the solar portal will appear on the page. The box (☑) next to the portal name was activated automatically.
  - ➜ Data transfer is now activated.

Note: To end the data transfer, see chapter 8.5 (page 52).

- Check that the connection is OK.
- Enter the words "go online" in the "Portal code" field.
- Confirm by clicking on "adopt".
- Open the "Info page".

If a value in minutes is stated in the "last connection to portal" field, there is a connection to the solar portal.

You can then register on the solar portal and use the inverter to create a system and/or add the inverter to this system.

Note: An inverter first has to log onto the portal ("go online") before it can be assigned to a system in the portal.

5.7 Connecting communication components with communication board II

Now install the available communication components, such as an analogue modem, cable etc. The GSM modem is an exception, since the PIN code of the SIM card must be entered **before** the GSM modem can be installed in the inverter with the SIM card (see section 6.2.2).

⚠ DANGER

Risk of death due to electrical shock!

Single-insulated cables from communication components may come into contact with parts carrying mains voltage if the insulation is damaged.

- Only connect **double-insulated cables** to the inverter.

ATTENTION

The communication board may be damaged by electrostatic discharge.

- Touch a grounded point, for example the holder for the housing screw connection on the bottom right, before touching the circuit board.

Overview of the communications interfaces

In terms of communication options, four different situations are taken into account.

1. Inverter configuration.
2. Direct retrieval of the current yield value and/or saved log data.
3. Transferring the yield data to an Internet solar portal.
4. Remote retrieval of the current yield value and/or saved log data.

Situation 1: Configuring the inverter

All communication settings – for example, activation of data transfer to a solar portal – are made via the integrated web server. To access the configuration on the web server, you will need a computer, which must be connected to the inverter.

The inverter is equipped with two Ethernet interfaces (RJ45 sockets) for this purpose. The computer must also be equipped with this type of interface. The operating system is irrelevant. An Internet browser must be installed on the computer.

You can then connect the inverter and computer either

a) directly via an Ethernet cable (see illustration 39) or

b) via a local network (switch and Ethernet cable, see figure 40).

Version a) is the best option when no switch is available.
Version b) is the best option when a local network is already available. Several inverters can also be connected in the network (figure 38).

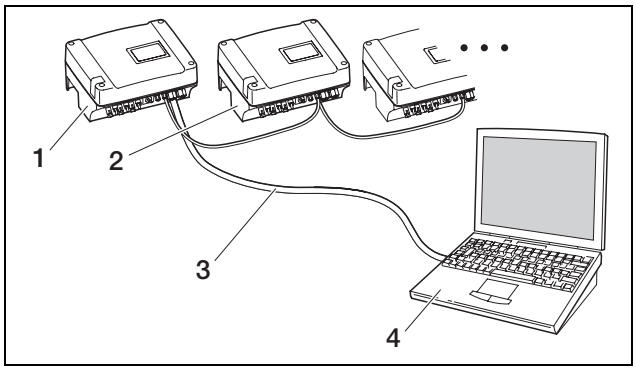


Fig. 38: *Multiple inverters in the network*

1 Inverter
2 Additional inverters
3 Ethernet cable
4 Computer (for configuration or data retrieval)

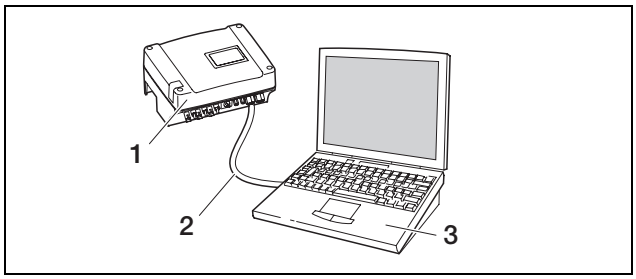


Fig. 39: *Connecting inverter and computer with Ethernet cable*

1 Inverter
2 Ethernet cable
3 Computer (for configuration or data retrieval)

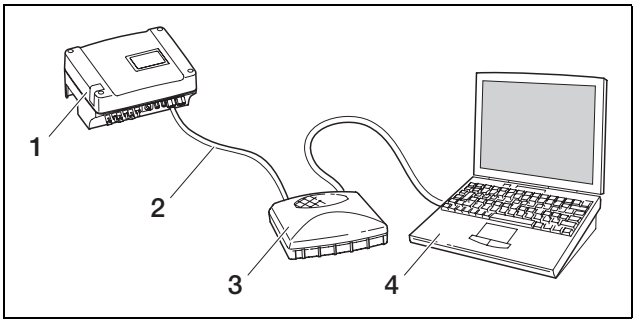


Fig. 40: *Connecting inverter and computer with Ethernet cables and switch*

1 Inverter
2 Ethernet cable
3 Switch/hub
4 Computer (for configuration or data retrieval)

Situation 2: Direct retrieval of the yield data

The retrieval of the current yield data as well as the stored inverter log data is also only possible using a computer. The units are cabled as described under situation 1.

Alternatively, you can connect the inverters to each other via the RS485 interface and then only need to connect one of the inverters via Ethernet (figure 41).

With this type of connection, the web server of the inverter connected via the Ethernet also displays the current output data of the other inverters. However, the web server and the stored log data are only available for the inverter connected via Ethernet.

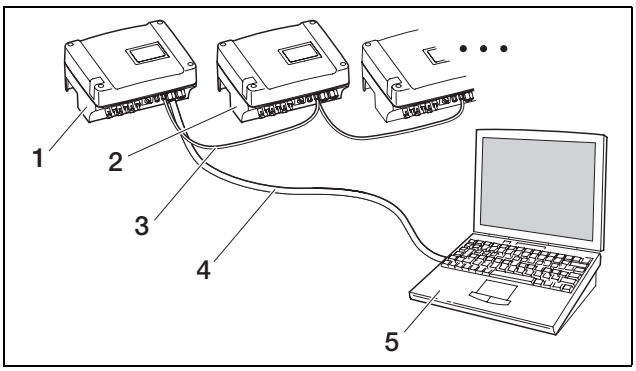


Fig. 41: *Connecting inverters via the RS485 and retrieving performance data via Ethernet*

1 Inverter
2 Additional inverters, max. 200 depending on cable length
3 RS485 connection
4 Ethernet cable
5 Computer

Situation 3: Data transfer to a solar portal

The inverter can send yield data to an Internet solar portal at regular intervals.

To do so,

a) the inverter must be connected to a DSL router or to a network with Internet access or

b) the inverter must have an integrated analogue modem or wireless modem (GSM, available as an accessory).

Version a) requires a DSL connection. If your inverter is located close to where you already have a DSL connection, you can use the available connection for transmission.

Note: If the inverters are connected to the Internet by DSL router in the local network, both direct retrieval of the log data as well as transmission of the log data of all connected inverters is possible through a solar portal.

Version b) with an analogue modem requires the inverter to be connected to a separate analogue telephone connection or an analogue extension of a telecommunications system. This requires a telephone connection close by. The inverter must be connected to the telephone connection at all times.

For version b) with a wireless modem, you will require a SIM data card from a mobile phone provider. There must also be adequate wireless reception at the point of installation.

Make sure that the access point name is set correctly. To do this, use the "GSM-Link" configuration tool, "Settings" page (see section Installing GSM modem). You will find a detailed description on our website.

Note: Inadequate reception quality – for example in areas with a low network coverage – can lead to connection problems and to the GSM modem dialling into the net too often. Depending on the price model of the GSM contract, this can result in increased costs. The reception quality is also affected by the weather. We recommend testing the reception with a normal mobile telephone for a few days prior to installation to ensure that adequate reception is possible despite differing weather conditions.

Note that the antenna position depends on the maximum cable length of the GSM antenna of 8 m!

Note: For installations with several inverters, you will only need **one** modem.

Version b)

To transfer the data of several inverters to a solar portal with a modem, connect the inverter via the Ethernet. You will only need one modem: the inverter with the modem then assumes the function of a router for the other inverters.

The number of network connectable inverters is in principle only limited by the available IP addresses. In practice, for data transfers via GSM or analogue modem, a max. of 30 inverters can be networked, for data transfers via DSL, a max. of 300 inverters can be networked.

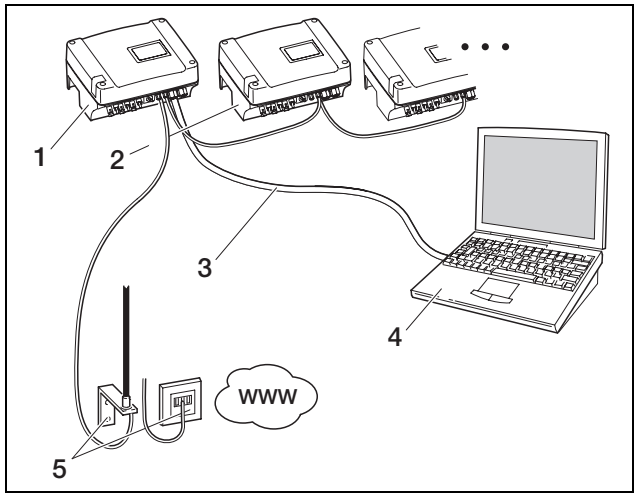


Fig. 42: *Connecting several inverters through the Ethernet and transferring data via modem*

1 Inverter with an integrated modem (analogue or GSM)
2 Additional inverters (without a modem), max. 29
3 Ethernet cable
4 Computer (for configuration and, if applicable, direct retrieval)
5 Telephone connection box or mobile communications antenna (depending on the modem being used)

Situation 4: Remote retrieval of yield data

You can also connect to the inverter remotely instead of through a local network. This may possibly involve additional connection costs.

Similar to situation 3, the inverter must either

a) be connected to a DSL router or

b) have a modem (analogue or GSM) installed.

Version a) Inverter with DSL connection to the Internet

To ensure the inverter can actually be accessed via the Internet, several requirements must be met.

— The inverter must have a fixed IP address in the local network.

— Port forwarding must be configured to the inverter IP address in the router.

— The router must be assigned a fixed IP address by the Internet provider or you must register the router with a DynDNS service to connect the dynamic router IP address with a fixed name.
The inverter can then be accessed over the Internet under the domain name provided by the DynDNS service, and you can connect to the inverter with any Internet browser (see figure 43).

Setting up a port forwarding and a DynDNS service can not be illustrated in detail here due to the vast number of different devices and services available.

Note: DynDNS services are also referred to as "Dynamic DNS" and "DNS host service provider". For the router to remain accessible at all times under the selected domain name, the router communicates each change of IP address to the DynDNS service. Many of the available routers offer such a function, however, a router usually only supports certain DynDNS services.
With certain router manufacturers, the port forwarding function is called "virtual server" or a similar term.
For further information, see the operating manual of the router.

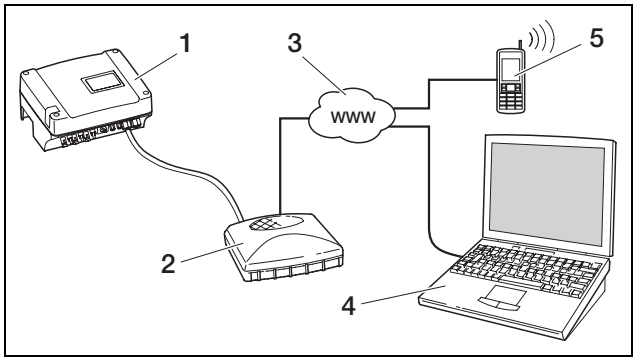


Fig. 43: *Retrieving log data: Inverter connected to the Internet via DSL*

1 Inverter
2 DSL router
3 Internet
4 Computer
5 Internet-compatible mobile phone with browser function

Version b) with an integrated modem

An inverter connected to the telephone network by an analogue modem can only be contacted by a computer when the computer establishes the connection via an analogue telephone connection or via the analogue connection of a telecommunications system (dial-in connection, see figure 44).

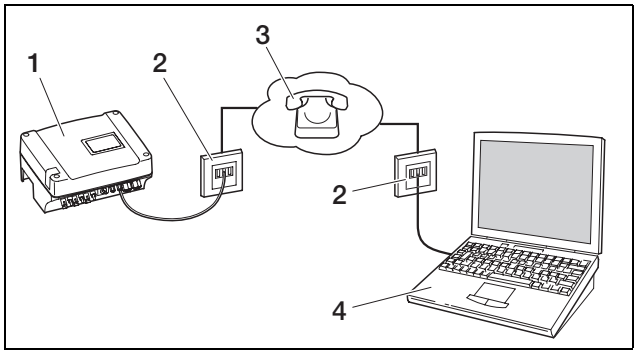


Fig. 44: *Retrieving log data: Inverter connected to a telephone network*

1 Inverter with integrated analogue modem
2 Telephone socket
3 Telephone network
4 Computer with modem

Dialling in with a computer and analogue telephone connection does not function reliably for an inverter with GSM modem. We therefore recommend dialling in via a computer with a GSM modem or a mobile telephone with a modem function (see figure 45).

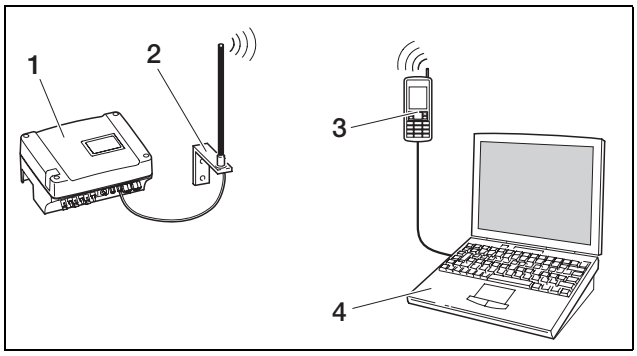


Fig. 45: *Retrieving log data: Inverter connected to a mobile communications network*

1 Inverter with integrated GSM modem
2 Mobile communications antenna
3 Mobile telephone (GSM) with modem function
4 Computer

Overview of the communications interfaces

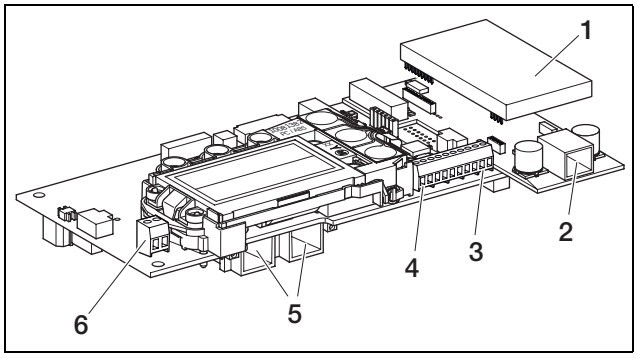


Fig. 46: *Communication interfaces Communication board II*

1 Modem (accessory)
2 RJ11 socket
3 Terminal for RS485 interface
4 S0 voltage output
5 RJ45 sockets
6 S0 alarm output

Connecting Ethernet cable

You can connect the inverter to a computer or a computer network (Ethernet 10/100 MBit/s) via the RJ45 socket.

- Insert the plug of the Ethernet cable into one of the corresponding sockets (5 figure 46).

Installing analogue modem

A prerequisite for use of an analogue modem is an analogue telephone connection. Using a modem involves additional costs. Details can be obtained from telecommunications providers.

- Carefully attach modem to circuit board. The uppermost plug pin on the left must be inserted into the uppermost hole in the multipoint connector.

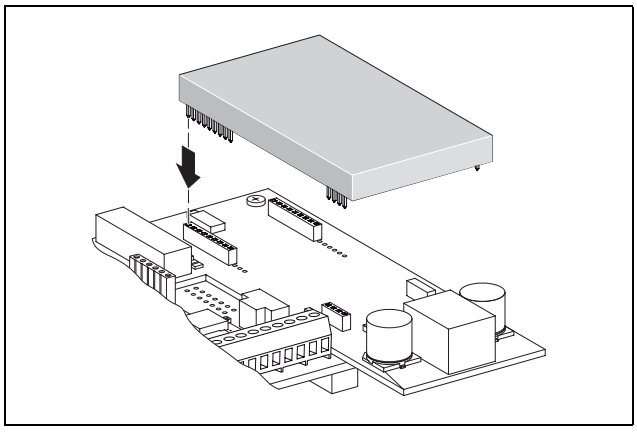


Fig. 47: *Installing the modem*

- Connect the telephone cable (see the following section).

Connecting the telephone cable

The RJ11 socket is used to connect the inverter to an analogue telephone jack or to an ISDN line with a terminal adapter. To use the RJ11 interface, you will require a modem, available as an accessory.

- Insert the plug of the telephone cable into the corresponding socket (2 figure 46).

Installing GSM modem

In order to use the GSM modem, you will need a SIM data card with a contract with a mobile phone provider. The GSM-Link software leaves you free to select your mobile phone provider. Using a modem involves additional costs. Details can be obtained from telecommunications providers.

Not every mobile phone contract is suitable for use with an inverter service request.
Before purchasing the SIM data card, discuss the following points with your mobile phone provider and obtain all the access data you require (APN, user name and password).

— You should select a provider whose network supplies the strongest GSM signal at your chosen location.
— The tariff must allow for packet data communication via GPRS.
— Prepaid cards which are charged by mobile calls are not suitable.
— Tariffs which specify particular times for data downloads cannot be used.
— The tariff must permit a data volume of at least 5MB per month and inverter.
— It must be possible for the data settings (APN etc.) to be configured by hand.
— The SIM card must be activated before installation.

- Switch the inverter off for **at least 5 minutes**.

Fatal voltages are produced in the inverter during operation. Only a qualified electrician may open and perform work on the unit.

•Open the cover.

- Connect an Ethernet cable to the communication board (RJ45 interface (network connection)) and connect to the PC.
- Switch the inverter back on again.
- In the Internet browser, enter the serial number, inverter name or IP address in the address line to go to the inverter's web server (e.g. s081230001 or s90342IE100001 or 192.168.1.1).
- Enter the PIN number on the "Settings" page in the "GSM PIN" field.

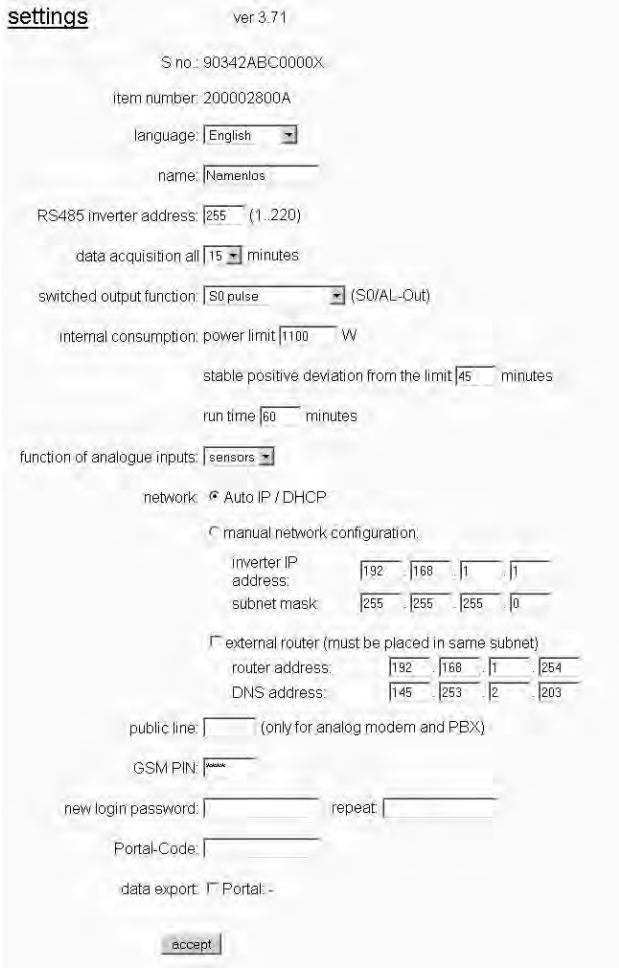


Fig. 48: *Settings page*

- Launch the "GSM-Link" software.

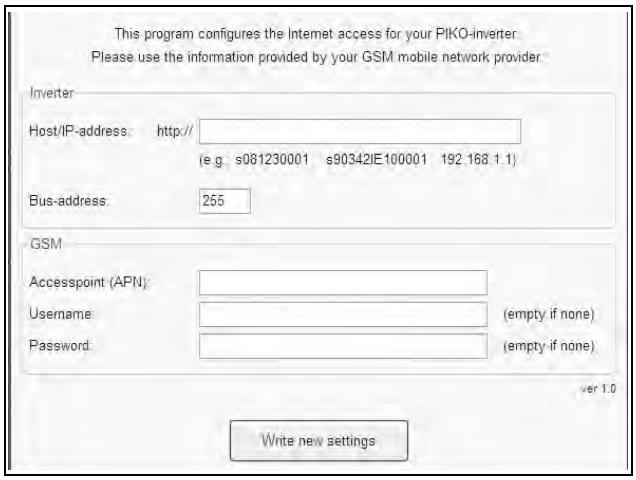


Fig. 49: *GSM-Link*

- Enter the serial number or IP address of the inverter in the "Host/IP address" field (note: enter the letter S and the inverter's serial number, for example http://S12345FD323456.)
- In the GSM area, enter the data (APN, user name and password) of the SIM card in the corresponding fields and confirm by selecting "Write new settings".
- Switch the inverter off for **at least 5 minutes**.
- Slide the SIM card into the card holder on the underside of the modem.
- Carefully attach GSM modem to circuit board. The uppermost plug pin must be inserted into the uppermost hole in the multipoint connector.

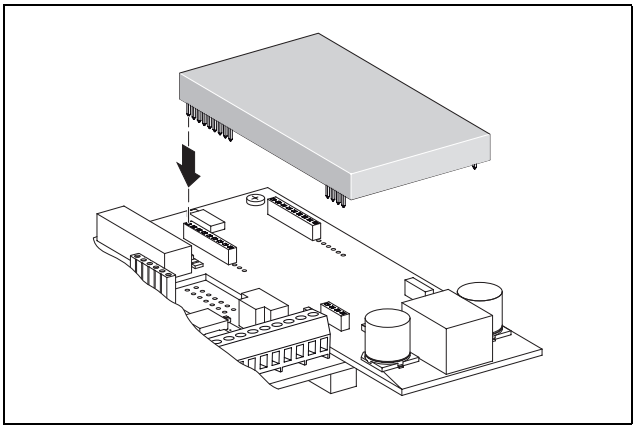


Fig. 50: *Installing the modem*

- Insert the plug of the radio antenna into the GSM modem.
- Install the radio antenna where it will have the best possible reception.
  Note: The reception quality will be displayed on the web server info page after starting up (see section ‹Checking sensors and modem› in chapter 6.2).
- Switch the inverter on again and wait at least 2 minutes.
- In the Internet browser, enter the serial number, inverter name or IP address in the address line to go to the inverter's web server.
- Check the current modem status on the "Info page"

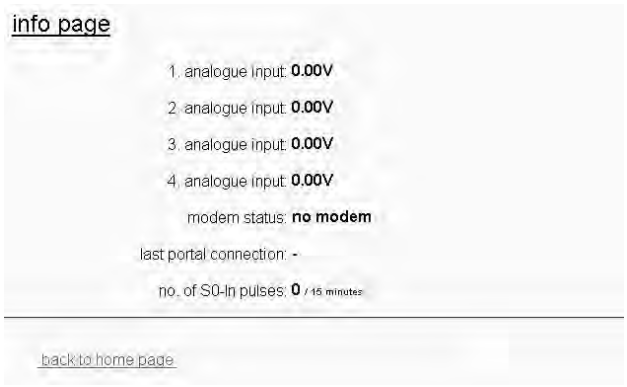


Fig. 51: *Modem status*

- If the "Modem status: GSM signal strength" field is displaying at least two bars, the connection is OK.

Activating data transfer to a solar portal

The factory default setting does not include a solar portal. To use a solar portal, you will need a portal code. You can get further information on this from our service hotline (+49 761 477 44 - 222).

Only the name of **one** solar portal will be displayed. It is not possible to use several portals at the same time.

- Open the web server's "Settings" page (see illustration 48).
- Enter the code for the intended solar portal in the "Portal-Code" field.

The portal code for Piko-control is P3421.
The portal code for safer‘Sun (www.meteocontrol.com) is P202L.

- Click on "adopt" to save the settings.

  The name of the solar portal will appear on the page. The box (☑) next to the portal name was activated automatically.

  Data transfer is now activated.

Note: To end the data transfer, see chapter 8.5 (page 52).

- Check that the connection is OK.
- Enter the words "go online" in the "Portal-Code" field.
- Confirm by clicking on "adopt".
- Open the "Info page".

If a value in minutes is stated in the "last connection to portal" field, there is a connection to the solar portal.

You can then register on the solar portal and use the inverter to create a system and/or add the inverter to this system.

Note: An inverter first has to log onto the portal ("go online") before it can be assigned to a system in the portal.

5.8 Installing accessories with communication board I

If available, now install accessories such as sensors or ripple control receiver.

⚠ DANGER

Risk of death due to electrical shock!

The communication board is energised!
Single-insulated cables from communication components may come into contact with parts carrying mains voltage if the insulation is damaged.

- Only connect double-insulated cables in the inverter.

ATTENTION

The communication board may be damaged by electrostatic discharge.

- Touch a grounded point, for example the holder for the housing screw connection on the bottom right, before touching the circuit board.

Overview of the accessory interfaces

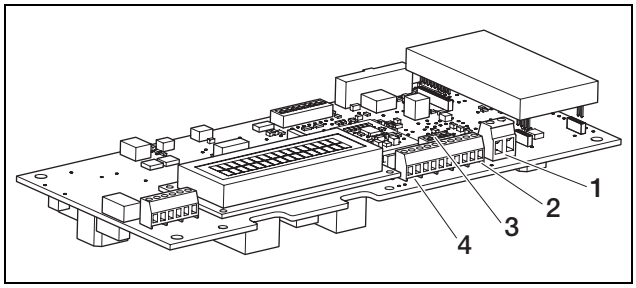


Fig. 52: *Communication board I connections*

1 Switch output (S0/Al OUT)
2 RS485 interface
3 DIP switch for RS485 configuration
4 Terminal for analogue interfaces

Connecting the switch output

The switch output (terminal S0/AL-OUT, position 1 in fig. 52) has different functions depending on how it is set (see ‹Setting the switch output function› on page 39). It can be used as an S0 interface, as an alarm output or for switching on devices (for internal consumption).

S0 interface: The switch output functions as a pulse output as described in DIN EN 62053-31 with a constant rate of 2000 pulses per kilowatt hour. Using a suitable receiver device such as an energy meter or a display, you can record and display the energy yield of your photovoltaic system.

Alarm output: The switch output functions as a potential-free NC contact. It opens when a malfunction occurs (see ‹Faults› on page 48).

Internal consumption: The switch output functions as a potential-free NO contact. It closes when the set conditions are fulfilled (see section ‹Setting the conditions for switching on devices (internal consumption)› on page 39).
For more information, refer also to the text and image in section ‹Internal consumption›, on page 8.

Max. load	100 mA
Max. voltage	250 V (AC or DC)
Connections	Neutral polarity

Table 5: *Switch output technical data*

Note: You must install a component such as an external load relay between the inverter and the consumer device. Do not connect any consumer devices *directly* to the switch output.

- Connect all wires to the appropriate terminals (fig. 52, position 1).

Connecting the S0 input (energy pulse meter)

The S0 input allows you to record the pulses of an energy meter or a second inverter.

Note: While the second inverter will not be displayed in the solar portal, its energy yield is included in the first inverter's data (in total).

When using the S0 input, the analogue inputs AIn3 and AIn4 are inactive. The web server of the inverter shows the pulses counted on the info page.

- Connect the lines to the terminal (4 in figure 52) according to the terminal assignment (table 6).

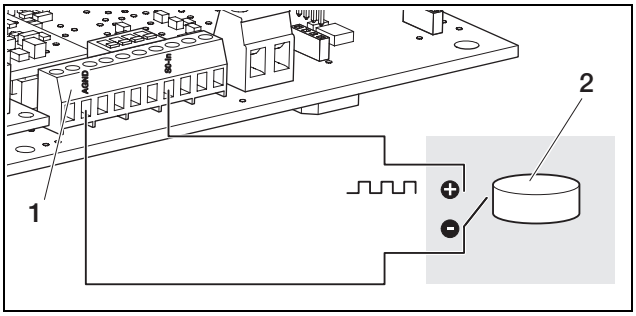


Fig. 53: *Example of the connection of an external energy meter at the S0 In input*

1 S0 In input
2 External energy meter

Connecting analogue sensors

The inverter features four analogue inputs to which you can connect, for example, temperature and irradiation sensors or wind sensors. The additional measured data enable a more precise monitoring of the photovoltaic system.

The sensors must have an output voltage of 0...10 V (factory setting). An additional voltage supply may be required, depending on the sensor.

Note: When using the S0 input, the analogue inputs AIn3 and AIn4 are inactive.

Note: If the inverter is intended for connecting a ripple control receiver, you cannot connect sensors.

- Connect the lines to the terminal according to the terminal assignment (figure 54 and table 6).

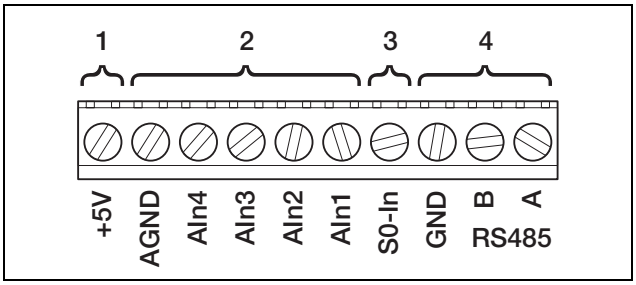


Fig. 54: *Cable terminal*

1 Voltage output
2 Analogue inputs
3 S0 input (energy pulse meter)
4 RS485

Terminal	Designation	Description
1	RS485 A	RS485 A
2	RS485 B	RS485 B
3	GND	Ground for RS485
4	S0 In	S0 input (energy pulse meter)
5	AIn1	Inputs for analogue sensors (0...10 V) or for ripple control receivers
6	AIn2	
7	AIn3	
8	AIn4	
9	AGND	Ground for analogue inputs and S0 input
10	+5V	5 V output for external sensors (not potential-free; max. 10 mA) or for ripple control receivers

Table 6: *Cable terminal connection assignment*

Connecting a ripple control receiver for active power control

Note: The information in this section applies only to systems in Germany.

The inputs for analogue sensors can be used to connect a ripple control receiver for active power control (in accordance with the Renewable Energy Law, as applicable in Germany). This function must be activated via the inverter web server (see section ‹Setting the analogue input functions› in chapter 6.2.2).

The inverter must then be linked via Ethernet (figure 55) or RS485 (figure 56) so that the inverter connected to the ripple control receiver can forward the information received to the other inverters.

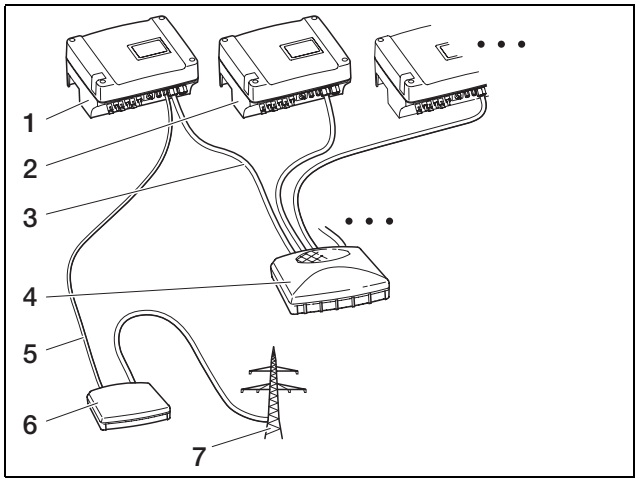


Fig. 55: *Connecting the ripple control receiver for inverters with Ethernet connections*

1 Master inverter
2 Additional inverters
3 Ethernet cable
4 Switch/hub
5 5-conductor connection at analogue-in
6 Ripple control receiver
7 Grid

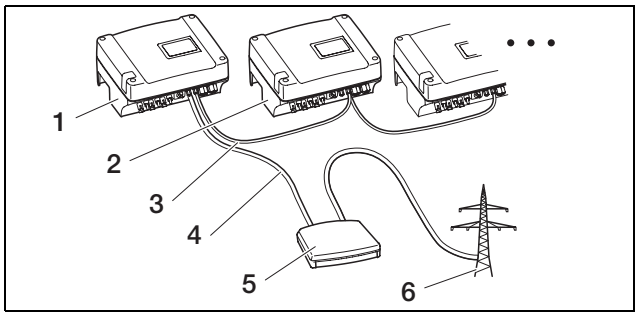


Fig. 56: *Connecting the ripple control receiver for inverters with RS485 connections*

1 Master inverter
2 Additional inverters
3 RS485 connection (2-conductor)
4 5-conductor connection at analogue-in
5 Ripple control receiver
6 Grid

- Connect the ripple control receiver lines in accordance with the terminal assignment (figure 57 and table 6).

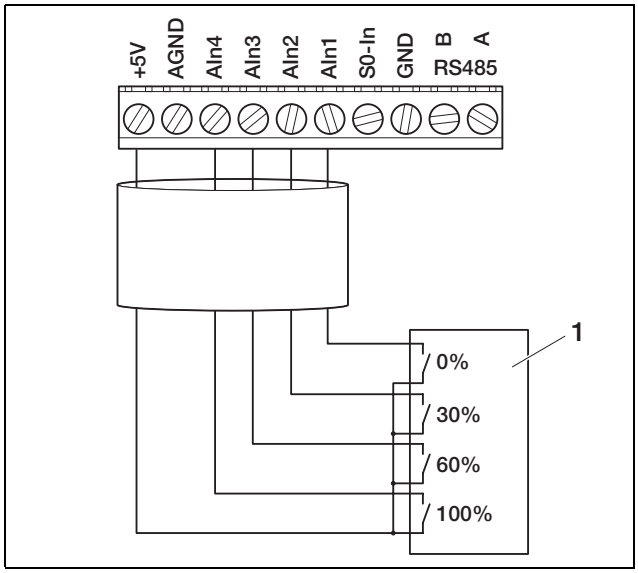


Fig. 57: *Connecting the ripple control receiver to the inverter*

1 Ripple control receiver

Connecting RS485

Connections for the serial **RS485 interface are found on the terminal for analogue interfaces (figure 54).** Using RS485 , up to 200 inverters – depending on the inverters used – can be connected, see Table 7. Additional components can be connected to RS485. An additional level converter may be required in some cases. Use a twisted-pair cable for connection, such as LiYCY 2 × 2 × 0.25.

To do so, the DIP switch for the RS485 configuration (1 in figure 58) must be set accordingly on the communication boards of all inverters.

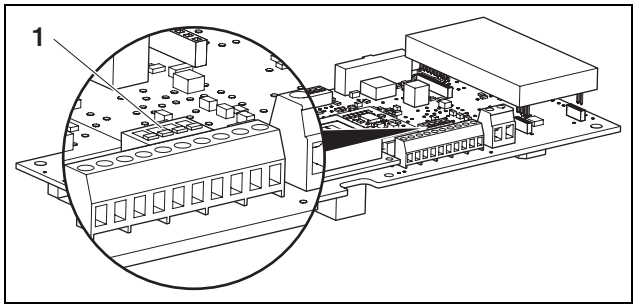


Fig. 58: *DIP switch for RS485 configuration*

1 DIP switch for RS485 configuration

It is possible to mix inverters with and without DIP switch for the RS485 configuration. The potential connection scope and the DIP switch setting required are illustrated in Table 7.

If all inverters for connection are equipped with DIP switches, cable lengths of up to 500 m are possible.

Note: If other RS485 units are connected in a RS485 network in addition to the inverters (e. g. a display), the number of inverters which can be connected and the maximum cable lengths may be limited.

ATTENTION

The communication board may be damaged by electrostatic discharge.

- Use a blunt, non-metallic utensil to activate the DIP switch.
- Touch a grounded point, for example the holder for the housing screw connection on the bottom right, before touching the circuit board.

- If necessary, switch the termination on using DIP switch 1 and switch the bus supply voltage on using the DIP switches 2 and 3.

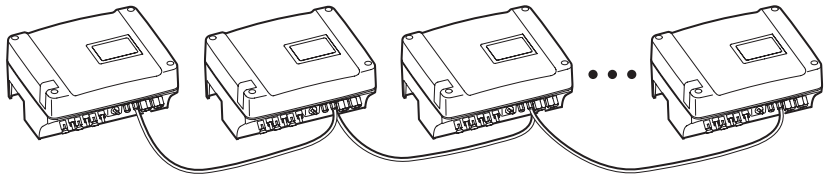
Connection scope	Inverter 1	2	3	n
				
max. 20 inverters	without DIP switch	without DIP switch	without DIP switch	without DIP switch
max. 20 inverters	without DIP switch	without DIP switch	without DIP switch	
max. 20 inverters when the inverter is at a distance of n	without DIP switch			
max. 200 inverters				

Table 7: *DIP switch for RS485 configuration*

Note: If you have the corresponding expertise, you can connect the inverter to a serial interface (RS232 or USB) of your computer via a signal level converter. For this type of connection, however, only the current performance data can be accessed. The integrated web server and the stored log data are not available.

- Connect the lines to the terminal (4 in figure 54) according to the terminal assignment (table 6).

5.9 Installing accessories with communication board II

If available, now install accessories such as sensors or ripple control receiver.

⚠ DANGER

Risk of death due to electrical shock!

Single-insulated cables from communication components may come into contact with parts carrying mains voltage if the insulation is damaged.

- Only connect double-insulated cables in the inverter.

ATTENTION

The communication board may be damaged by electrostatic discharge.

- Touch a grounded point, for example the holder for the housing screw connection on the bottom right, before touching the circuit board.

Overview of the accessory interfaces

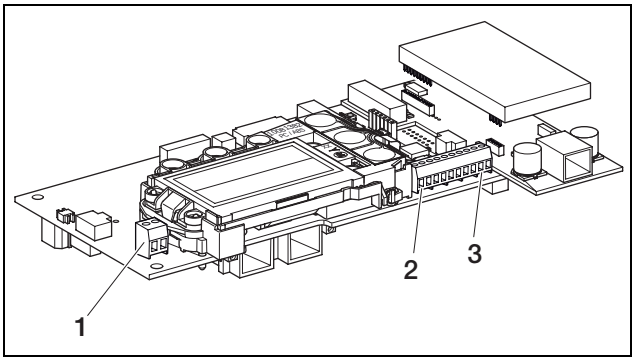


Fig. 59: *Communication board II connections*

1 Switch output (S0/Al OUT)
2 Terminal for analogue interfaces
3 RS485 interface

Connecting the switch output

The switch output (terminal S0/AL-OUT, position 1 in fig. 59) has different functions depending on how it is set (see section ‹Setting the switch output function› on page 39). It can be used as an S0 interface, as an alarm output or for switching on devices (for internal consumption).

S0 interface: The switch output functions as a pulse output as described in DIN EN 62053-31 with a constant rate of 2000 pulses per kilowatt hour. Using a suitable receiver device such as an energy meter or a display, you can record and display the energy yield of your photovoltaic system.

Alarm output: The switch output functions as a potential-free NC contact. It opens when a malfunction occurs (see ‹Faults› on page 48).

Internal consumption: The switch output functions as a potential-free NO contact. It closes when the set conditions are fulfilled (see section ‹Setting the conditions for switching on devices (internal consumption)› on page 39).
For more information, refer also to the text and image in section ‹Internal consumption›, on page 8.

Max. load	100 mA
Max. voltage	250 V (AC or DC)
Connections	Neutral polarity

Table 8: *Switch output technical data*

Note: You must install a component such as an external load relay between the inverter and the consumer device. Do not connect any consumer devices *directly* to the switch output.

- Connect all wires to the appropriate terminals (fig. 59, position 1).

Connecting the S0 input (energy pulse meter)

The S0 input allows you to record the pulses of an energy meter or a second inverter.

Note: While the second inverter will not be displayed in the solar portal, its energy yield is included in the first inverter's data (in total).

When using the S0 input, the analogue inputs Aln3 and Aln4 are inactive. The web server of the inverter shows the pulses counted on the info page.

- Connect the lines to the terminal (4 in figure 59) according to the terminal assignment (table 9).

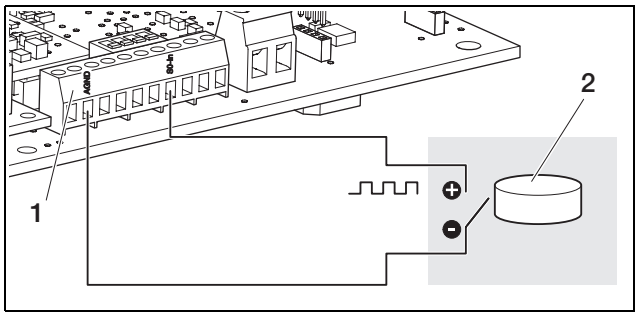


Fig. 60: *Example of the connection of an external energy meter at the S0 In input*

1 S0 In input
2 External energy meter

Connecting analogue sensors

The inverter features four analogue inputs to which you can connect, for example, temperature and irradiation sensors or wind sensors. The additional measured data enable a more precise monitoring of the photovoltaic system.

The sensors must have an output voltage of 0...10 V. An additional voltage supply may be required, depending on the sensor.

Note: When using the S0 input, the analogue inputs AIn3 and AIn4 are inactive.

Note: If the inverter is intended for connecting a ripple control receiver, you cannot connect sensors.

- Connect the lines to the terminal according to the terminal assignment (figure 61 and table 9).

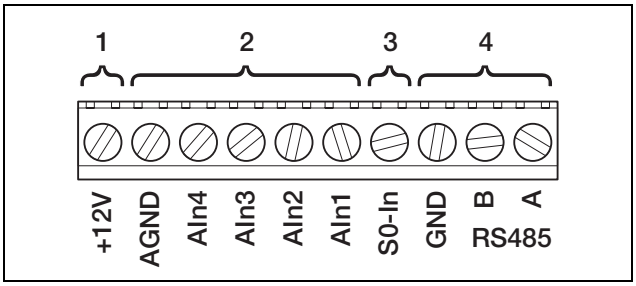


Fig. 61: *Cable terminal*

1 Voltage output
2 Analogue inputs
3 S0 input (energy pulse meter)
4 RS485

Terminal	Designation	Description
1	RS485 A	RS485 A
2	RS485 B	RS485 B
3	GND	Ground for RS485
4	S0 In	S0 input (energy pulse meter)
5	AIn1	Inputs for analogue sensors (0...10 V) or for ripple control receivers
6	AIn2	
7	AIn3	
8	AIn4	
9	AGND	Ground for analogue inputs and S0 input
10	+12V	12 V output for external sensors (not potential-free; max. 100 mA) or for ripple control receivers

Table 9: *Cable terminal connection assignment*

Connecting a ripple control receiver for active power control

Note: The information in this section applies only to systems in Germany.

The inputs for analogue sensors can be used to connect a ripple control receiver for active power control (in accordance with the Renewable Energy Law, as applicable in Germany). This function must be activated via the inverter web server (see section ‹Setting the analogue input functions› in chapter 6.2.2).

The inverter must then be linked via Ethernet or RS485 (figure 62) so that the inverter connected to the ripple control receiver can forward the information received to the other inverters.

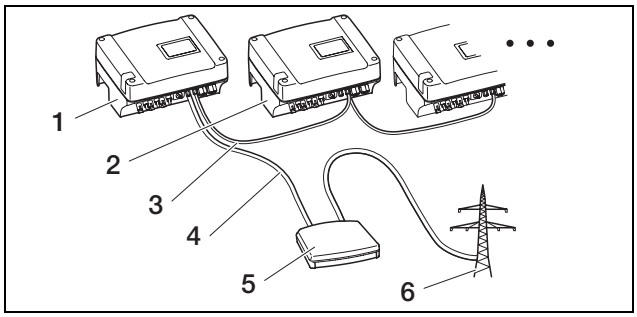


Fig. 62: *Connecting the ripple control receiver for inverters with Ethernet or RS485 connections*

1 Master inverter
2 Additional inverters
3 Ethernet cable, alternatively RS485 connection (2-conductor)
4 5-conductor connection at analogue-in
5 Ripple control receiver
6 Grid

- Connect the ripple control receiver lines in accordance with the terminal assignment (figure 63 and table 9).

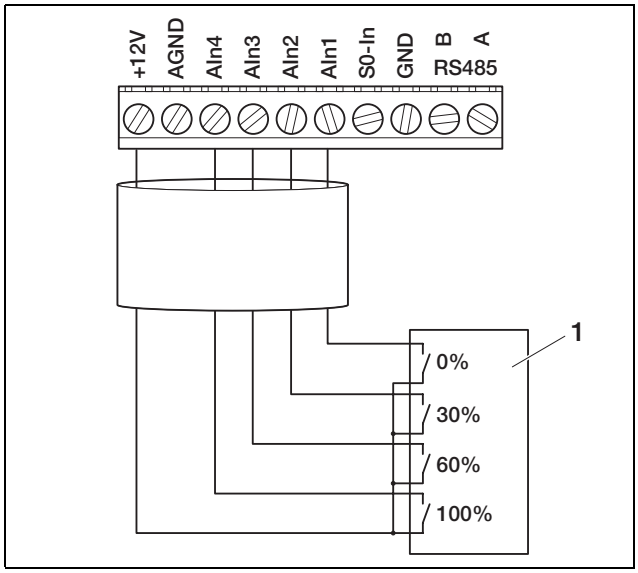


Fig. 63: *Connecting the ripple control receiver to the inverter*

1 Ripple control receiver

Connecting RS485

Connections for the serial **RS485 interface are found on the terminal for analogue interfaces (figure 61).** Using RS485 , up to 200 inverters – depending on the inverters used – can be connected.
Additional components can be connected to RS485. An additional level converter may be required in some cases. Use a twisted-pair cable for connection, such as LiYCY 2 × 2 × 0.25.

To do this, you must set the bus prestress and bus termination menu items in the user menu to ON (fig. 84).

If using an inverter with communication board II, all other inverters must also be fitted with communication board II. Cable lengths of up to 500 m are possible.

Note: If other RS485 units are connected in a RS485 network in addition to the inverters (e. g. a display), the number of inverters which can be connected and the maximum cable lengths may be limited.

- For the connection, activate the bus prestress in the user menu of the first inverter and the bus termination in the user menu of the first and last inverters.

Note: If you have the necessary expertise, you can connect the inverter to a serial interface (RS232 or USB) of your computer via a signal level converter. For this type of connection, however, only the current performance data can be accessed. The integrated web server and the stored log data are not available.

- Connect the lines to the terminal (4 in figure 61) according to the terminal assignment (table 6).

5.10 Closing the housing

- Using cable ties, fasten all cables to the recesses in the protective plate.
  Ensure that all cables run directly **over** the protective plate and do not protrude over the side of the protective plate.

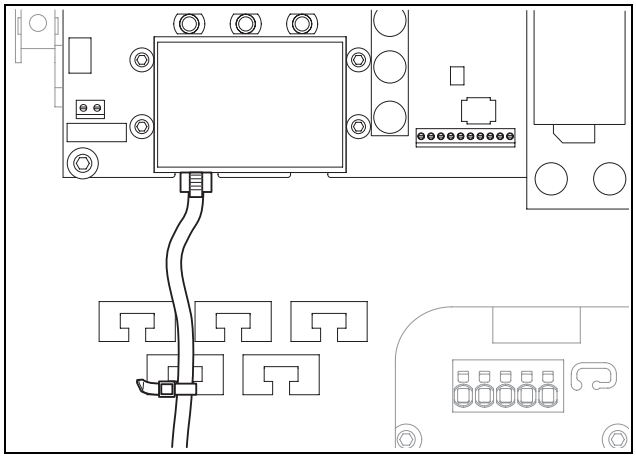


Fig. 64: *Fastening cable to protective plate*

- Screw all union nuts together with sealing ring tightly onto the cable screw connection. Recommended tightening torques: 1.5 Nm (M12) and 8 Nm (M25).
- Check whether all lines are securely connected and cannot become loose.
- Remove any foreign objects from the inverter (tools, wire cuttings, etc.).
- Fit the cover and bolt it tight.

6 Commissioning and de-commissioning

6.1 Switching on the inverter

For the initial commissioning, sufficient solar irradiation must exist so that a DC input voltage of at least 180 V is available for the inverter.

- Turn the DC load break switch to ON or switch on the DC strings one after another via the external DC isolator.

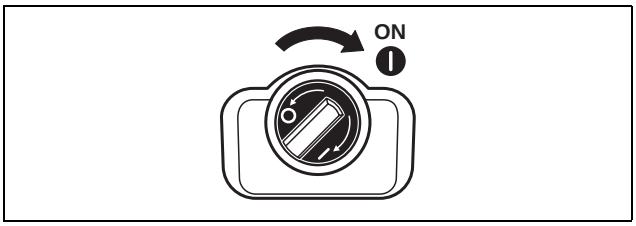


Fig. 65: *DC load break switch ON*

- Switch on the grid voltage via the line circuit breaker.

If the following message appears on the display, the country of use is not set.

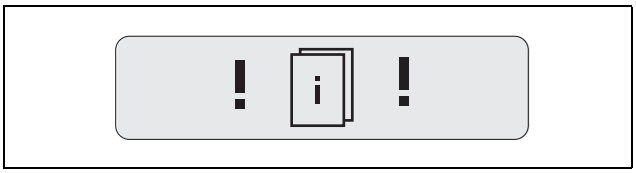


Fig. 66: *Display message if the country of use is not set (communication board I)*

If using communication board I, switch off the device voltage on the AC and DC sides and set the country of use as described in chapter 5.5.

Fig. 67: *Display message if the country of use is not set (communication board II)*

The inverter is now in operation: the display lights up and successively shows the device type, the country setting, the hardware and software versions and the name of the inverter.

The yellow LED lights up and the device automatically carries out the required tests according to DIN VDE 0126. If the yellow LED does not light up, the input voltage may be too low.

When the tests have been successfully completed, the green LED lights up and the inverter begins feeding in current to the grid.

If the green LED does not light up, the input voltage or the power may be too low or a fault has occurred (see the chapter "Fault correction").

Note: With a limited power input, PIKO 4.2/5.5/8.3/10.1 use only one or two phases for feeding current into the grid. The device selects the phase on a random basis each time.

Setting the language

- If desired, set the display to a different language (see chapter 7.4).

6.2 Setting up communication and accessories

Perform the remaining setup using the web server of the inverter.

Note: You can change all settings which you make at any time and as often as you like with the exception of the country of use.

6.2.1 Connecting to the web server of the inverter

- Connect the inverter with a computer, as described in chapter 5.6 or 5.7.
- Set the Ethernet interface (TCP/IP protocol) of the computer so that the IP address automatically obtains the DNS server address. To alter this setting, administrator access rights may be required.
- Start your Internet browser and enter the letter S and the serial number of the inverter in the address bar, for example http://S12345FD323456

  The log-in window for the web server opens.
- Enter user name and password. The factory defaults for user name and password are set as follows:

  User name: pvserver
  Password: pvwr

- Confirm the inputs by clicking on "OK".

  The main screen of the inverter is displayed.

Fig. 68: *Main page of the web server (the number of inputs- and outputs displayed may vary depending on unit type).*

6.2.2 Configuring settings

- Click on the "Settings" link.

  The "Settings" page is displayed.

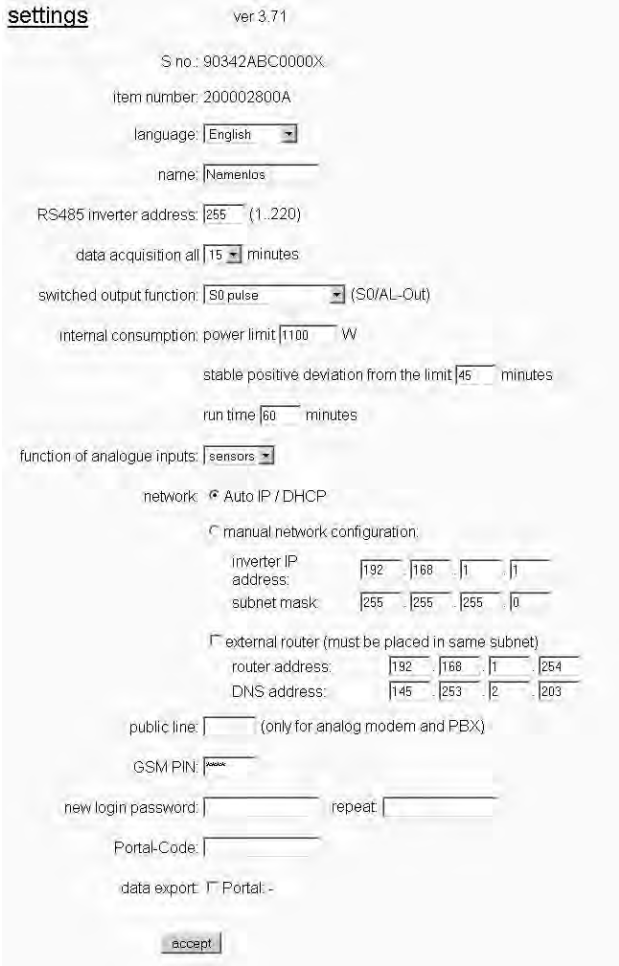


Fig. 69: *Settings page*

Setting	Description
S-no.	Inverter serial number
Item number	Item number of the inverter
Language	Selection of the language for the web display
Name	Allocation of a name to the inverter
RS485 inverter bus address	Unit address for the RS485 interface
Data acquisition	Choose between a saving interval of 15 or 60 minutes
Switch output function	This defines whether the switch output is used as an S0 interface, alarm output or for switching devices (for internal consumption).
Internal consumption	Settings for controlling internal consumption. *These settings only take effect when the switch output function is set to "internal consumption".*
Function of analogue inputs	Configuration of the analogue inputs for connecting sensors or for active power control

Table 10: *Web server settings*

Setting	Description
Network	Configuration of the inverter network interface (Ethernet)
Public line	Only required when using an analogue modem (optional accessory) and an analogue telephone system
GSM PIN	PIN for the GSM modem SIM card. For further information on configuration and installation of the GSM modem, see chapter 5.7.
New log-in-password	Change of password
Portal code	Entry field for the portal code for changing the solar portal displayed upon 'data export'
Data export	Activation of data transfer to the solar portal displayed (☑) or deactivation (☐)

Table 10: *Web server settings* (cont.)

Changing the language

You can select a different language for the web server from the drop-down list.

- Select the intended language.
- Click on "accept" to save the settings.

Changing the name

You can assign a name of your own choosing to the inverter. When connecting the browser to the web server you can then use the name instead of the serial number. Access with the serial number remains possible.

- Type in the name you have chosen. The letters a–z, A–Z and numbers 0–9 are all permitted. Diacritics, spaces or special characters are not permitted.
- Click on "accept" to save the settings.

Note: Make a note of the new name for the inverter. The name is also shown in the display of the inverter in the submenu "settings".

Configuring the RS485 address

If you have linked two or more inverters via RS485, you must set the RS485 addresses of the inverter so that each address is unique.

- Enter the desired address in the field "Inverter bus (RS485) address".
- Click on "accept" to save the settings.

Changing the saving interval

When selecting the saving interval, you have the option of a 15-minute or 60-minute period between the saving procedures. The internal memory can store the data for approximately 100 days if the 15-minute period is selected and for about 400 days with the 60-minute period.

The inverter data are only saved in the unit for a limited time. When the internal memory is full, the oldest data will be overwritten.

To save the data on a long-term basis, you can either transfer the data to a solar portal or download them to a computer.

- Select the desired saving interval.
- Click on "accept" to save the settings.

Setting the switch output function

- Select whether the switch output is to be used as an S0 interface, alarm output or for switching devices (internal consumption).
- If the output is to be used for controlling internal consumption, you must make some additional settings (see the following section ‹Setting the conditions for switching on devices (internal consumption)›).
- Click on "accept" to save the settings.

Setting the conditions for switching on devices (internal consumption)

To ensure that the device is only switched on when the inverter produces sufficient electricity, you can specify certain conditions.

Power limit: This is the minimum power (in watts) that the inverter must be producing before the device is switched on. You can enter any value from 1 watt to 999000 watts.

Stable positive deviation from the limit: This is the period (in minutes) during which the inverter must produce at least the power set in the “power limit” field before the device is switched on. You can enter any value from 1 minute to 720 minutes (= 12 hours).

Run time: The connected device is switched on for this period (in minutes) when both the above conditions have been met. You can enter any value from 1 minute to 1440 minutes (= 24 hours).

The run time is interrupted if the inverter is switched off. As soon as sufficient power is available again, the run time is resumed.

The run time is ended and not continued again if the inverter has not produced any current for three hours. This normally happens after sunset.

- You can enter you own values in the “power limit”, “stable positive deviation from the limit” and “runtime” fields or use the defaults.
- Click on "accept" to save the settings.

Setting the analogue input functions

- Select whether the analogue inputs should be used for connecting sensors or a ripple control receiver for active power control.
- Click on "accept" to save the settings.

Configuring the network

Sample images are provided for both communication boards I and II.

As the standard default setting, the option "Auto IP / DHCP" is activated. This means that the inverter obtains its IP address automatically from a DHCP server, such as from a DSL router for example. (A DHCP server is a program which assigns a network address to its subscribers). If no DHCP server is available, the inverter assigns an IP address to itself.

- The option "Auto IP/DHCP" is suitable for most applications (figure 70 or 71).

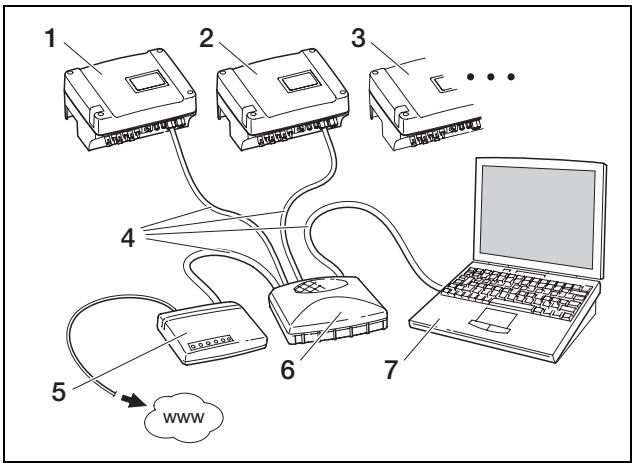


Fig. 70: *Communication board I:*
Network settings with automatic network configuration for an external DSL router (◉ Auto IP/DHCP, ☑ external router)

1 Inverter 1 – Auto-IP / DHCP
2 Inverter 2 – Auto-IP / DHCP
3 Inverter 3 – Auto-IP / DHCP
4 Ethernet cable
5 DSL router – with DHCP server
6 Switch/hub
7 Computer with network setting "Obtain IP address automatically"

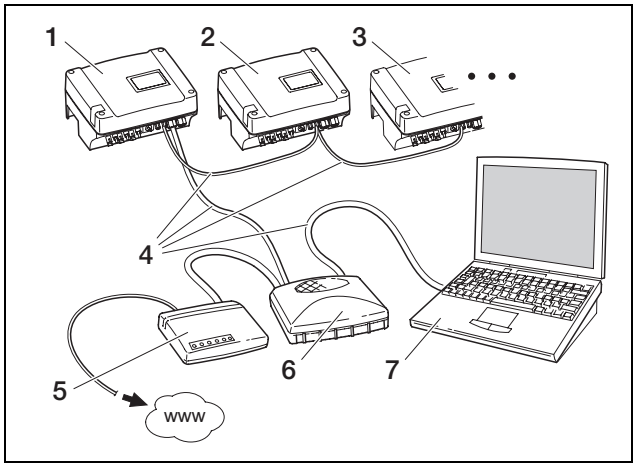


Fig. 71: *Communication board II:*
Network settings with automatic network configuration for an external DSL router (◉ Auto IP/DHCP, ☑ external router)

1 Inverter 1 – Auto-IP / DHCP
2 Inverter 2 – Auto-IP / DHCP
3 Inverter 3 – Auto-IP / DHCP
4 Ethernet cable
5 DSL router – with DHCP server
6 Switch/hub
7 Computer with network setting "Obtain IP address automatically"

Network with a fixed IP addresses

Sample images are provided for both communication boards I and II.

A fixed IP address assignment ("manual network configuration" setting) is only required in a few cases:

— You have a local network (Ethernet) with fixed IP addresses and wish to integrate the inverter into the network (figure 72 or 73).

— Or you operate the inverter through a DSL connection with router and wish to connect to the inverter remotely via the router (figure 74 or 75).

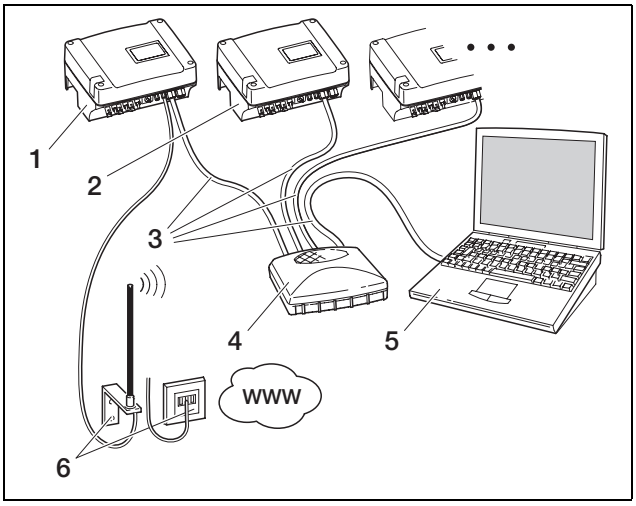


Fig. 72: *Communication board I:*
Network settings with Auto IP
(◉ Auto-IP / DHCP, ☐ external router)

1 *Inverter with an integrated modem (analogue or GSM) – Auto IP/DHCP*
2 *Optional additional inverters (without modem) – Auto-IP / DHCP*
3 *Ethernet cable*
4 *Switch/hub*
5 *Computer with network setting "Obtain IP address automatically"*
6 *Telephone connection or mobile communications antenna*

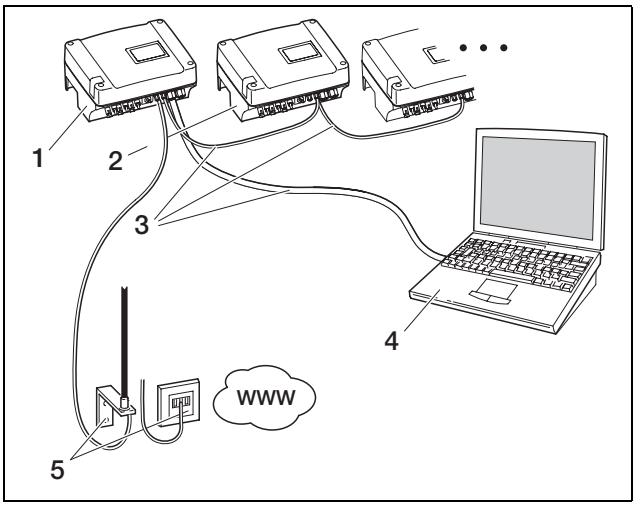


Fig. 73: *Communication board II:*
Network settings with Auto IP
(◉ Auto-IP / DHCP, ☐ external router)

1 *Inverter with an integrated modem (analogue or GSM) – Auto IP/DHCP*
2 *Optional additional inverters (without modem) – Auto-IP / DHCP*
3 *Ethernet cable*
4 *Computer with network setting "Obtain IP address automatically"*
5 *Telephone connection or mobile communications antenna*

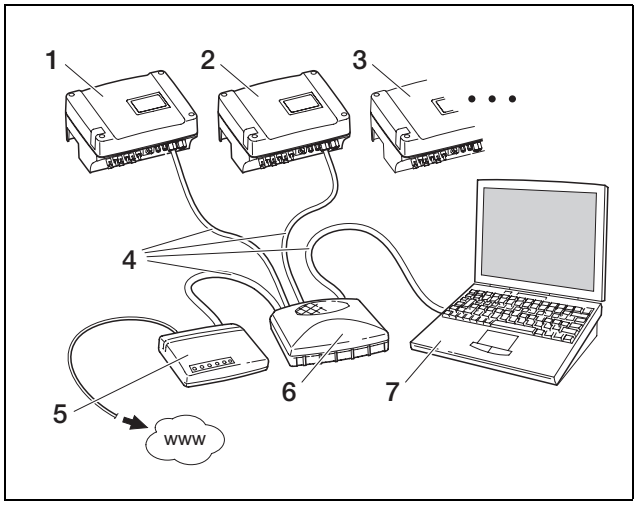


Fig. 74: *Communication board I:*
Network settings with manual network configuration for external DSL router, subnet mask: 255.255.255.0, ☑ external router

1 *Inverter 1 – IP address 192.168.1.2*
2 *Inverter 2 – IP address 192.168.1.3*
3 *Inverter 3 – IP address 192.168.1.4 and so on*
4 *Ethernet cable*
5 *DSL router – IP address 192.168.1.1*
6 *Switch/hub*
7 *Computer – IP address 192.168.1.250*

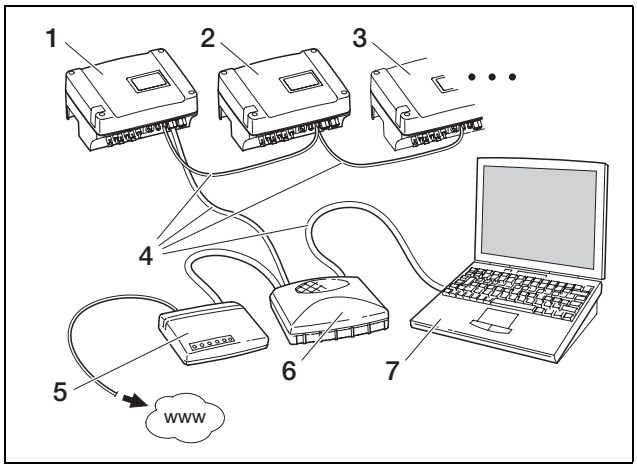


Fig. 75: *Communication board II:*
Network settings with manual network configuration for external DSL router, subnet mask: 255.255.255.0, ☑ external router

1 *Inverter 1 – IP address 192.168.1.2*
2 *Inverter 2 – IP address 192.168.1.3*
3 *Inverter 3 – IP address 192.168.1.4 and so on*
4 *Ethernet cable*
5 *DSL router – IP address 192.168.1.1*
6 *Switch/hub*
7 *Computer – IP address 192.168.1.250*

Note: The factory default setting of the DNS server address is 145.253.2.203, and it provides the alternative name resolution in the Internet. Do not change this setting, as the export of log data to a solar portal may otherwise not function anymore.

- Activate the setting "manual network configuration" if you wish to assign a fixed IP address. Enter the IP address and subnet mask.

Note: The changed settings take effect immediately upon clicking on "adopt". Your inputs may have the consequence that the inverter is no longer accessible through the current connection.

- Click on "accept" to save the settings.
- If the inverter is to use an external router to send data to a solar portal, activate the option "external router" and enter the IP-address of the router.
- Click on "accept" to save the settings.

Entering the public line number (for analogue modems only)

- If applicable, enter the public line number.
- Click on "accept" to save the settings.

Entering the PIN code (for GSM modems only)

You must enter the PIN code that you received from your mobile phone provider in the configuration of the inverter **before** you install the GSM modem with the SIM card.

- Enter the PIN code of the GSM card.
- Click on "accept" to save the settings.

Note: If you subsequently change your mobile phone provider, **first** enter the new GSM PIN in the web server of the inverter and **then** replace the SIM card in the GSM modem.

Changing the password

You can change the preset log-in password on the integrated web server.

- Type in the intended password. The letters a–z, A–Z and numbers 0–9 are all permitted. Diacritics, spaces or special characters are not permitted.
- Type the password into the "repeat" field again.
- Click on "accept" to save the settings.

Note: Your old password becomes invalid immediately after the password change. You should therefore note the password as a precaution.
Forgotten the password? Our customer service is on hand to assist.

Note: The user name cannot be changed.

6.2.3 Checking sensors and modem

- On the main page of the web server, click on the link "info page".

  The "info page" window then opens.

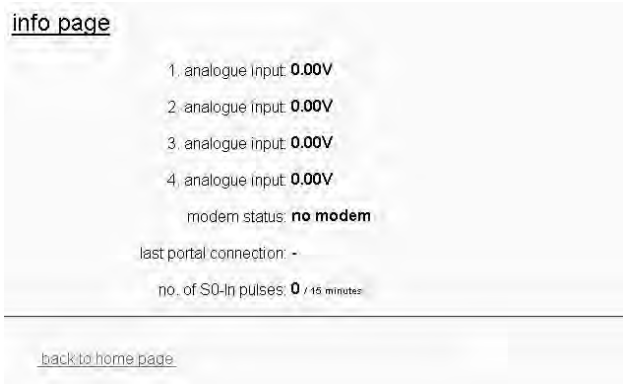


Fig. 76: *Info page*

Entry	Description
x- analogue input	Shows the voltage which is currently available on the analogue input x
Modem status	Shows the modem status: – When the analogue modem is connected correctly, "analogue modem detected" is displayed. – When the GSM modem is connected correctly, the GSM signal strength is displayed. – When the modem is connected incorrectly or not available, "modem not available" is displayed.
Last portal connection	Displays how many minutes ago the inverter last transferred data to the solar portal (when the function is active)
No. of energy pulses	Displays the number of energy pulses per time unit occurring at the S0 interface

Table 11: *Info page*

- Check whether the modem has been detected (analogue modem) or whether adequate reception quality – at least two bars – is displayed (GSM modem).

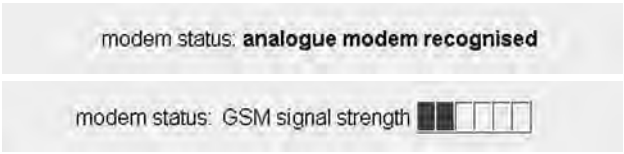


Fig. 77: *Modem status*

- If the reception quality is too low, try placing the GSM antenna in another location.
  Note that the reception quality also depends on the weather conditions.

Note: Reception quality which is inadequate can lead to connection problems and to the GSM modem dialling into the net too often. Depending on the price model of the GSM contract, this can result in increased costs.

- Click on "back to home page" to display the home page again.

6.2.4 Activating data transfer to a solar portal

The factory default setting does not include a solar portal. To use a solar portal, you will need a portal code. You can get further information on this from our service hotline (+49 761 477 44 - 222).

Only the name of **one** solar portal will be displayed. It is not possible to use several portals at the same time.

- Open the web server's "Settings" page (see illustration 48).
- Enter the code for the intended solar portal in the "Portal-Code" field.

The portal code for Piko-control is P3421.
The portal code for safer'Sun (www.meteocontrol.com) is P202L.

- Click on "adopt" to save the settings.

  The name of the solar portal will appear on the page. The box (☑) next to the portal name was activated automatically.

  Data transfer is now activated.

6.2.5 Disconnecting

- Close the browser window to disconnect from the web server of the inverter.

6.3 Handover to the operator

After successful installation and commissioning, give the inverter and this manual to the user. Advise the operator about the following points:

- The position and function of the DC load break switch or the external DC isolator and the AC line circuit breaker.
- Safety when handling the device.
- Appropriate procedure when checking and servicing the unit.
- Meaning of the LEDs and the display messages.
- Contact person in the event of a fault.

6.4 Switching the inverter off/decommissioning

For maintenance work and repairs, the inverter must be switched off. It is not necessary to switch the converter off during normal operation.

- Turn the DC load break switch to OFF (figure 78) or switch off the solar generator via the external DC isolator.

  No more DC input current is fed to the inverter and it ends the feed-in operation.

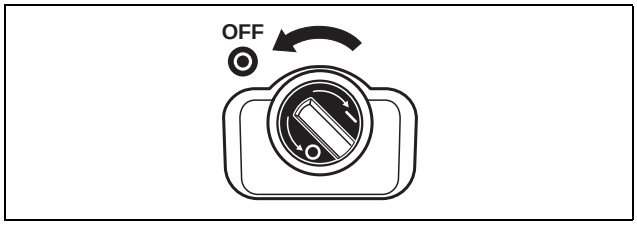


Fig. 78: *DC load break switch OFF*

In the event that you wish to perform work on the inverter or cables, you must **completely de-energise** the inverter:

- Disconnect the plug-in connectors by pushing the engaging clips together and pulling out the plug.

Note: The plug-in connectors are designed for only a limited number of application (see the manufacturer's specifications). For this reason, avoid plugging them in and unplugging them unnecessarily.

- Use the line circuit breaker to disconnect the inverter from the mains.
- Secure the voltage supply from being switched back on.
- Allow the unit to cool down. Wait five minutes until the condensers of the inverter have discharged.
- Ensure that all connections are de-energised.

6.5 Servicing/maintenance

⚠ DANGER

Risk of death due to improperly performed work!

Work performed improperly can cause life-threatening situations. Only qualified electricians or appropriately trained persons may perform work on the inverter.

Once correctly installed, the inverter operates nearly maintenance-free.

- Check the cable connections and plugs at least once a year.
  If there are loose connections, damaged cables, etc., switch off the inverter immediately.

Damage may only be repaired by qualified electricians.

Fan cleaning

For cooling during operation, inverters are equipped with one or two fans. To ensure that the fans function properly, you should regularly perform a test of the fans. If the fans are dirty, the inverter may not be adequately cooled and the efficiency of the unit decreases.

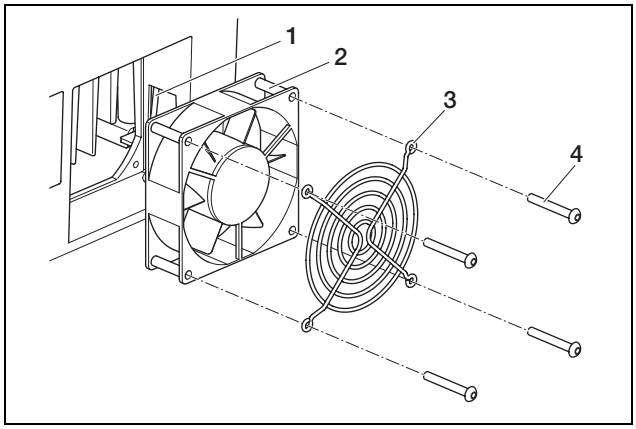


Fig. 79: *Removing the fan (*PIKO *3.0/3.6/4.2/5.5)*

1 Fan cable
2 Fan
3 Fan grille
4 Screws

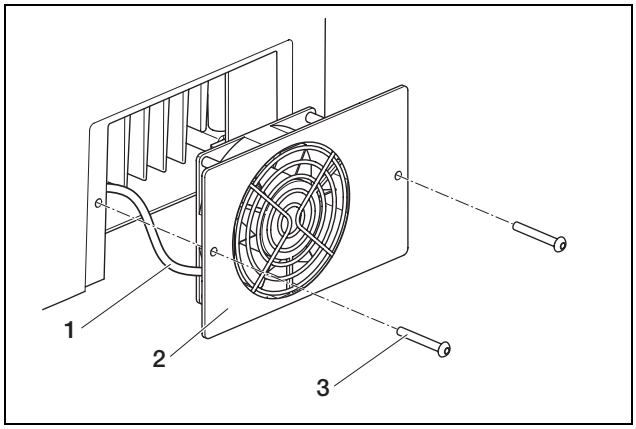


Fig. 80: *Removing the fan (*PIKO *8.3/10.1)*

1 Fan cable
2 Fan plate with fan and grille
3 Screws

The fan test can only be performed during feed-in mode (green LED lit). For information on starting the fan test, refer to chapter 7.4.

If the fan does not run properly, it should be cleaned. To do so, you must switch off the inverter:

⚠ DANGER

Risk of death due to electrical shock!

There are deadly voltages in the inverter during operation.

- Switch off the unit completely (DC side and AC side) before all work.
- Wait at least five minutes after switching off until the condensers have discharged.

- Switch off the inverter as described in chapter 6.4.

You can now clean the fan:

- PIKO 3.0/3.6/4.2/5.5: Loosen the screws (4 in fig. 79) and carefully remove the fan grille and the fan.
  PIKO 8.3/10.1: Loosen the screws (3 in fig. 80) and carefully remove the fan plate.
- Disconnect the fan cable plug connection.
- Clean the fan with a soft brush.
- PIKO 3.0/3.6/4.2/5.5: Reinsert the fan cable, place the fan back into the housing and screw the fan and the fan grille back on tightly.
  PIKO 8.3/10.1: Reconnect the fan cable and screw the fan plate back onto the housing.

You can now switch the inverter back on:

- Turn the DC load break switch to ON or switch on the DC strings one after another via the external DC isolator.

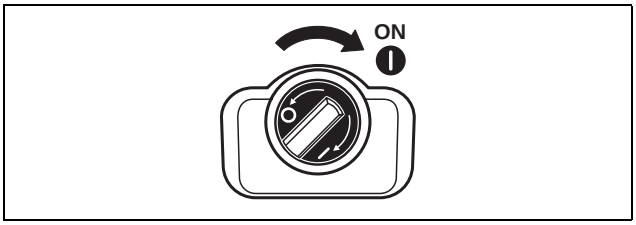


Fig. 81: *DC load break switch ON*

- Switch on the grid voltage via the line circuit breaker.

6.6 Disassembly and disposal

To disassemble the inverter, proceed as follows:

⚠ DANGER

Risk of death due to electrical shock!

There are deadly voltages in the inverter during operation.

- Switch off the unit completely (DC side and AC side) before all work.
- Wait at least five minutes after switching off until the condensers have discharged.

- Switch off the inverter as described in chapter 6.4.
- Open the cover of the inverter.
  Loosen the terminals and cable screw connections and remove all DC and AC-cables.
- Close the cover of the inverter.
  Loosen the screw on the underside of the inverter and lift the inverter off the wall mount.
- Disassemble the wall mount.

Disposal

Dispose of the inverter properly and in accordance with the applicable regulations.

The box of the inverter is made of cardboard and can be recycled as paper. Plastic parts and the packaging sack can be sorted to plastic recycling.

7 Inverter operating characteristics

The inverter will work automatically after commissioning, meaning that regular operation is not necessary.

As soon as the photovoltaic module generates sufficient current, the inverter begins feeding into the mains.

7.1 Display field

The inverter indicates the respective operating status through three LEDs and an LC display. You can also query operating values and enter settings on the display.

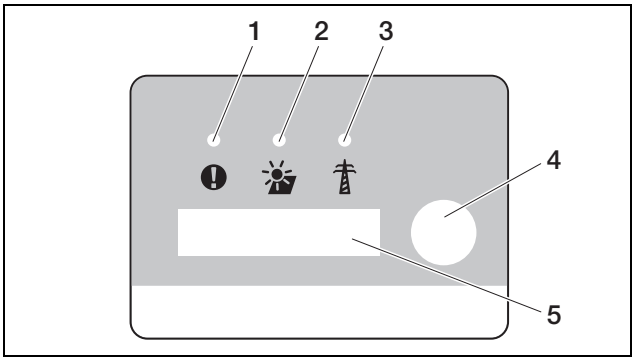


Fig. 82: *Display on the inverter (Communication board I)*

1 "Fault" LED (red)
2 "DC" LED (yellow)
3 "AC" LED (green)
4 Contact sensor
5 LC display

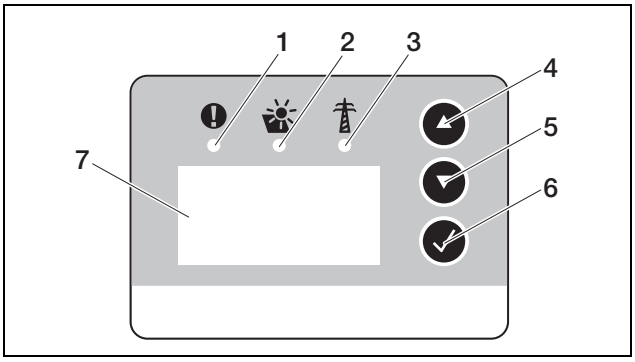


Fig. 83: *Display on the inverter (Communication board II)*

1 "Fault" LED (red)
2 "DC" LED (yellow)
3 "AC" LED (green)
4 "UP" arrow key
5 "DOWN" arrow key
6 Enter key
7 LC display

Note: The contact sensor responds to the touch of a finger. Do not press the contact sensor forcefully.

7.2 Determine the operating status (operating LEDs)

The LEDs on the front of the device indicate the current operating status.

LED	Description
"AC" LED lit in green	The green LED signals that the inverter is in feed-in mode if the output voltage of the photovoltaic module is more than 180 V.
"DC" LED lit in yellow	The yellow LED signals the active status of the inverter control unit. It lights up as soon as the output voltage of the photovoltaic module exceeds 100 V. If the output voltage falls below 100 V, the yellow LED goes out. Once energy is being fed into the mains grid, the yellow "DC" LED goes out and the green "AC" LED lights up.
No LED is lit	The device is operationally ready but the input voltage is less than 100 V. OR: The device is switched off.
"Fault" LED lights up or flashes red OR: "DC" LED flashes yellow	A fault has occurred. Remedial measures can be found in chapter 7.6.

Table 12: *LED indicators in operation*

7.3 Determining the operating status (display)

The operating statuses are shown on the display.

Display	Description
Off	Input voltage on the DC side (photovoltaic modules) is too low
Idle	Electronics are ready for operation, DC voltage is still too low for feed-in
Start	Internal control measurements according to VDE 0126
Feed-in (MPP)	Measurement successful, MPP control (MPP = maximum power point) active
Feed-in regulated	Feed-in power has been regulated due to excessive device temperature

Table 13: *Operating statuses*

7.4 Displaying operating values and changing settings (communication board I)

The user menu is activated through the round contact sensor on the right next to the display.

- Touch the contact sensor.

  The display illumination switches on.

  The operating values are each displayed successively for three seconds.

- To switch between the values more quickly, touch the contact sensor.

  The inverter acknowledges the switchover with a brief signal tone.

The following operating values are shown in the display successively:

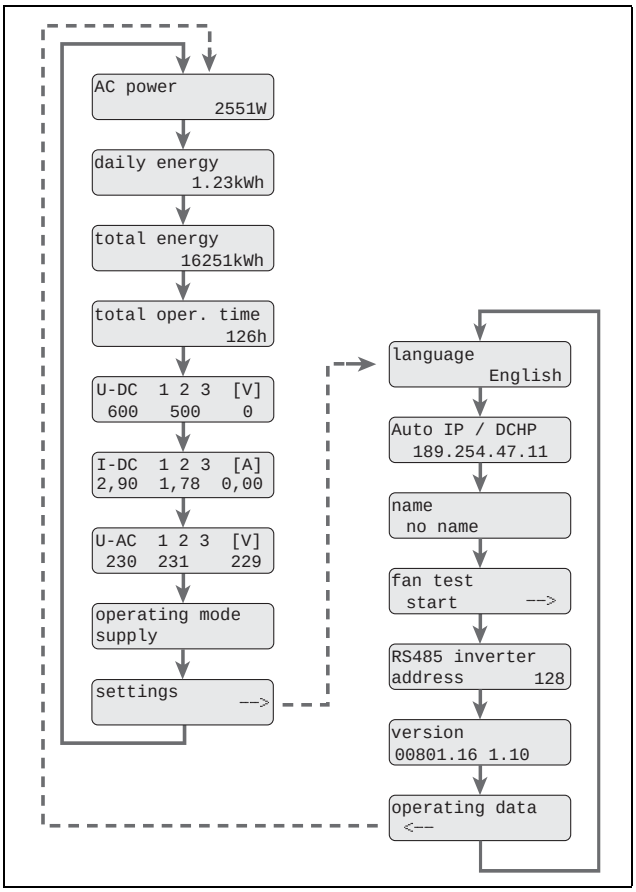


Fig. 84: *User menu and "settings" submenu*

- Place your finger on the contact sensor for several seconds
  ... to freeze the current display **or**
  ... to activate the submenu from the menu item "settings".

The following data can be accessed in the "settings" submenu:

— Language
— IP address
— Inverter name
— RS485 address
— Software version

- To switch between the values displayed, tap the contact sensor.
- To return to the main menu from the "operating values" menu item, place your finger on the contact sensor for several seconds.

Changing the language

- Go to the "settings" submenu and select the "language" menu option.
- To activate the language selection, place your finger on the contact sensor for several seconds.
- Lightly tap the contact sensor to display the available languages one after another.
- To confirm the selected language, place your finger on the contact sensor for several seconds.

Activate fan test

- Go to the "settings" submenu and select the "start fan test" menu option.
- To start the fan test, place your finger on the contact sensor for several seconds.

Note: The fan test is only possible during feed-in to the mains grid. If grid feeding is not actively occurring, the message "not possible, no DC power" appears.

- Note the running sounds of the fan. If the fan is not running or running sluggishly, it may need to be cleaned or repaired. For further information, see chapter 6.5.

7.5 Displaying operating values and changing settings (communication board II)

The user menu is activated by pressing any key to the right of the display.

- Tap e.g. the Enter key.

  The display illumination switches on.

  The operating values are each displayed successively for three seconds.

- Tap the arrow keys to switch between the values faster and in any direction.

  The inverter acknowledges the switchover with a brief signal tone.

The following operating values are shown in the display successively:

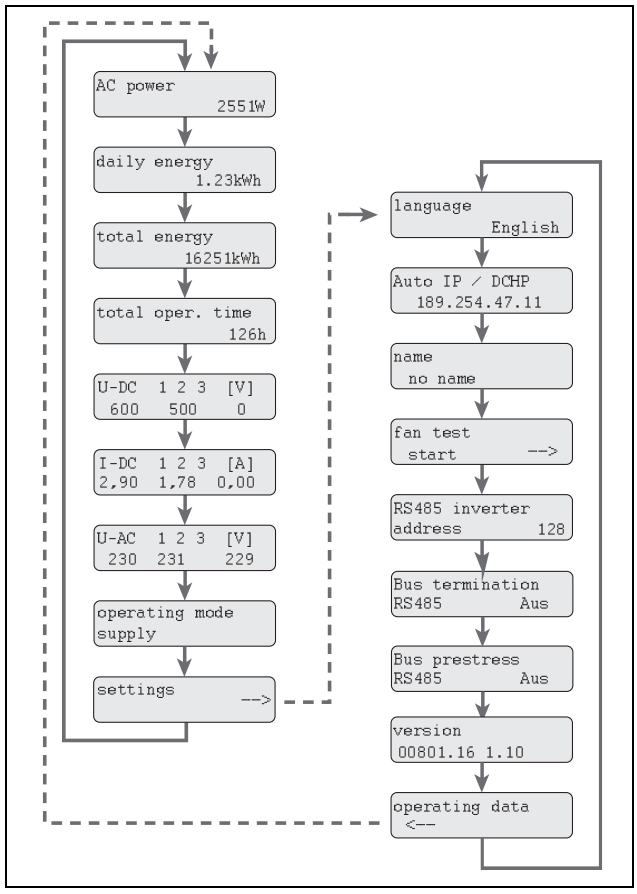


Fig. 85: *User menu and "settings" submenu*

- Press the Enter key,
  ... to freeze the current display **or**
  ... to activate the submenu from the menu item "settings".

The following data can be accessed in the "settings" submenu:

— Language
— IP address
— Inverter name
— RS485 address
— Bus termination
— Bus prestress
— Software version

- To switch between the values displayed, press the arrow keys.
- To switch from the "operating values" menu item to the main menu, press the Enter key.

Changing the language

- Go to the "settings" submenu and select the "language" menu option.
- To activate the language selected, press the Enter key.
- Press the arrow keys to display the available languages one after another.
- To confirm the language selected, press the Enter key.

Activating fan test

- Go to the "settings" submenu and select the "start fan test" menu option.
- To start the fan test, press the Enter key.

Note: The fan test is only possible during feed-in to the mains grid. If grid feeding is not actively occurring, the message "not possible, no DC power" appears.

- Note the running sounds of the fan. If the fan is not running or running sluggishly, it may need to be cleaned or repaired. For further information, see chapter 6.5.

7.6 Faults

The inverter interrupts the feed-in and switches off in the event of a fault.

- Check if the DC load break switch or the external DC isolator was opened.
- Check if the fault is due to a mains power failure or if the fuse between the feed meter and the inverter has tripped.

⚠ DANGER

Risk of death due to electrical shock!

Deadly voltages are present in the inverter. Only a qualified electrician may open and perform work on the unit.

If the fuse has tripped, notify the installer; if there is a power failure, simply wait until the mains operator has corrected the problem.

If the fault lasts only a short time (mains fault, excess temperature, overload, etc.), then the inverter will automatically resume operation as soon as the fault has been resolved.

If the fault persists, **notify your installer or the manufacturer's customer service department** (for contact information, see back page).

Provide the following information:

— Device type and serial number. You will find this information on the type plate on the exterior of the housing.

— Description of fault (LED indicator and display message).

Fault displays

The following table 14 provides an overview of possible fault messages with the corresponding LED indicator and display text.

LED	Display message	Cause of fault	Fault correction
"Fault" LED lights up red	**Neutral conductor fault**	Neutral conductor not connected.	Connect neutral conductor.
	Mains fault or **Grid voltage fault** or **Mains frequency fault** or **Phase fault**	One of the following faults is present: – The mains is not present or is too weak. – The mains frequency is being affected by external consumer loads or generators. – The mains was externally switched off, the ENS switched off. – An insulation error in the installation triggered the FI protection. – The mains voltage is or briefly was too low.	Check the grid cabling from the inverter to the subdistribution units, especially the neutral and protective earth conductors. Check the mains: the voltage must be within certain limits, the values of which can be obtained from the hotline. The standard value for mains voltages in Germany is > 184 V and < 253 V. Note to electrician: Check the phase position. A phase angle of 120° ± 20° is acceptable. Check the insulation of the installation. Check whether the mains becomes sporadically loaded. Under certain circumstances, heavy consumer loads or generators in the mains environment (power units, heavy machines and the like) can cause the fault. If necessary contact the local electric power company through your installer; it is their responsibility to maintain a stable mains.
"Fault" LED flashes red	**Residual current fault**	Switch-off due to residual current.	Check the electrical installation for insulation errors, the DC side (PV modules) as well as the AC side (mains). Causes of faults could be, for example: frayed cable insulation, incorrectly connected plug-in connectors or moisture.
"DC" LED flashes yellow and "Fault" LED lights up red	**Insulation error fault**	The insulation resistance of the PV module wiring in relation to the grounding is too low.	Check the installation on the PV module side. Causes of faults could be, for example: frayed cable insulation, incorrectly connected plug-in connectors or moisture.
"AC" LED flashes green	**Overtemperature fault**	Unit has become too hot. The inverter has derated or temporarily switched off the power.	Wait until the unit has cooled down. The installation site is possibly not perfect and the inverter is not receiving enough cooling air. The inverter should not be exposed to direct sunlight. Check fans for dirt and clean, if necessary.
"DC" LED flashes yellow and "Fault" LED flashes red	**System fault**	Internal system fault in the inverter.	Contact customer service.

Table 14: *Faults*

8 System monitoring

Also observe the descriptions about communication and accessories in chapter 6.2 from page 37 on.

The inverter regularly records performance data, for example, the voltage generated by the photovoltaic modules or the quantity of current fed into the public grid. These log data are stored in the unit for about 100 days or 400 days, depending on the set saving interval (15 min. or 60 min.).

Note: Some of the data will also be shown on the inverter display during operation (see chapter 7.4).

There are two ways of retrieving, displaying and permanently saving all log data:

— Transfer the log data to a solar portal.

— Download the log data onto a computer.

You can, of course, make use of both options together.

Transfer the log data to a solar portal.

The inverter can transfer its log data automatically and at regular intervals to a solar portal in the Internet. The data transfer may involve potential additional costs. As a rule, you must register the inverter with the solar portal operator. You can get further information from our service hotline.Also refer to chapter 6.2.2.

The solar portal displays the data on an Internet page and archives them. This enables you to view the status of your photovoltaic system at any time and from anywhere. All you need is access to the Internet (computer, Internet hotspot, mobile phone, etc.)

Downloading the log data onto a computer.

Retrieve the performance data of your photovoltaic system directly from the inverter. To do so, establish a connection to your inverter with a computer. The integrated web server displays the current performance data clearly on HTML pages so that you can access the data with any conventional Internet browser. No special software is needed. In addition, you can download all saved log data and display using the free PIKO Master Control visualisation software (see chapter 8.4). Alternatively, you can use a spreadsheet application.

8.1 Displays and settings via web server

To quickly and easily retrieve the log data of your photovoltaic system, you have, in addition to direct data retrieval on the built-in display, the option of the following further communication channels:

— Data retrieval by computer/cable connection

— Data retrieval by remote access

— Data retrieval through a solar portal in the Internet

Depending on which communications interfaces are configured, you can access your inverter or several inverters with your computer directly by cable, through a network or through a web portal. The basic settings and accessing options on the integrated web server are identical in all cases.

Note: The inverter data are stored in the device only for a limited time, approximately 100 or 400 days, depending on the setting. To save the data on a long-term basis and be able to compare it, you should register at a solar portal or save the data on your own computer.

8.2 Logging into the web server

- Switch on your computer.
- Only for dialling in via analogue or GSM modem: Establish a dialling connection to the modem in the inverter.
- Open your Internet browser program.

Note: Make certain that the proxy server for LAN connections is deactivated.
For further information on network settings, refer to the operating system manual of your computer.

- If your computer is connected to the inverter **via an Ethernet network or via crossover cable**, enter an "S" into the address line of the browser, followed by the serial number of the inverter (see type plate), for example **http://S12345FD323456**

  The log-in window for the web server opens.

- If your computer is connected to the modem in the inverter **via dial-up connection**, enter the letters "wr.S" in the browser's address line followed by the serial number of the inverter (see type plate), for example **http://wr.S12345FD323456**.

  The log-in window for the web server opens.

Note: Instead of the serial number, you can also use the name of the inverter or the IP address, for example **http://name** or for a dial-in connection **http://wr.name** or **http://192.168.1.51** (if the inverter has this IP address).

You can find out how to allocate a name to the inverter or to change the name in section ‹Changing the name› in chapter 6.2.

- Enter user name and password. The factory defaults for user name and password are set as follows:

  User name: pvserver
  Password: pvwr

  You can change the password in the settings of the web server at any time (see section ‹Changing the password› in chapter 6.2). The user name cannot be changed.
- Click on "OK" to confirm you entry.

  The main screen of the web server will be displayed.

Fig. 86: *Main page of the web server (the number of inputs- and outputs displayed may vary depending on unit type).*

By clicking on the button "Display/update", you can update the data or – if operating several inverters that are linked via an RS485 network – select a different inverter via its RS485 address and access its current performance data.

8.3 Downloading log data

You can download the saved log data of the inverter as a text file (CSV). An explanation of the file structure can be found in table 15 on page 52.

- On the main page of the web server, click on the link "history".

  A window opens, prompting you to "open" or "save".

— By selecting the "open" option you can, for example, view the data with a spreadsheet program and graphically edit it.

— If you select the "save" option, you can save the data to your hard drive and later view and analyse it. This is the recommended procedure. Press the "save" button; create a folder for this on your hard drive, in which you can permanently store the data.

Note: To archive the data securely and permanently, you should create back up copies regularly.

8.4 Displaying log data

The log data includes information on your photovoltaic system.

To conveniently display log data, we recommend the **visualisation software** PIKO Master Control (PMC). You can download this free of charge from our website www.kostal-solar-electric.com

Note: Our visualisation software is in continual development. Visit our Internet site from time to time to check whether a new software version is available.

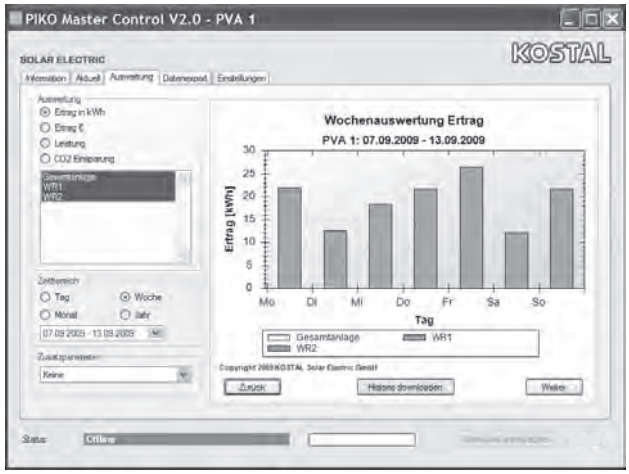


Fig. 87: *Visualisation software PIKO Master Control version 2*

If you are not using visualisation software, you can display the log data with any conventional spreadsheet application.

The following table 15 lists which measurement values are contained in the log data.

Entry	Description
Time	Details in seconds of the time since putting the inverter went into operation
DC1 U DC2 U DC3 U	DC voltage: input voltage of the respective string (1, 2 and 3) in V
DC1 I DC2 I DC3 I	DC current: input current of the respective string (1, 2 and 3) in mA
DC1 P DC2 P DC3 P	DC power: input power of the respective string (1, 2 and 3) in W
DC1 T DC2 T DC3 T	DC temperature: details for service
DC1 S DC2 S DC3 S	DC status: details for service
AC1 U AC2 U AC3 U	AC voltage: output voltage of the respective phase* (1, 2 and 3) in V
AC1 I AC2 I AC3 I	AC current: output current of the respective phase* (1, 2 and 3) in mA
AC1 P AC2 P AC3 P	AC power: output power of the respective phase* (1, 2 and 3) in W
AC1 T AC2 T AC3 T	AC temperature: details for service
AC F	AC frequency: grid frequency in Hz
AC S	AC status: Value Meaning 0 Inverter off 1 Inverter idling 2 Inverter starting up 28 Infeed*
FC I	Residual current: measured residual current in mA
AIn1 AIn2 AIn3 AIn4	Analogue input voltage: display of the analogue inputs 1 to 4 of the communication board. The measured voltage value in V can be calculated with the value from the table (digits) and the following formula: input voltage [V] = (10/1024) * digits If the S0 input is used to count the energy pulses, both table columns AIn3 and AIn4 give the sum of the energy pulses per log interval. This total value is calculated as follows: E_{total} = AIn3 * 2^{16} + AIn4
ERR	General malfunctions
ENS S	Status of the ENS (device for grid monitoring with assigned switching elements): status of grid monitoring Value Meaning 0 Grid monitoring deactivated 1 Initialisation phase 2 Pending (start-up of inverter) 3 Running (current feed-in to the grid) 15 Error
ENS Err	Malfunction of the ENS (device for grid monitoring with assigned switching elements)
KB S	Internal status of the communication: internal communication status when switching to AC grid.
Total E	Total energy: total fed-in energy in kWh when switching to AC grid.
Iso R	Insulation resistance: insulation resistance in kOhm when switching to AC grid.
Event	POR event, "power on reset": renewed start-up of communication after a loss of AC voltage.

Table 15: *Log data* (cont.)

***** With a limited power input, PIKO 4.2/5.5/8.3/10.1 use only one or two phases for feeding current into the grid. The device selects the phase on a random basis each time.

For the single-phase feed-in inverters PIKO 3.0/3.6 the value 0 (zero) is automatically entered for phases 2 and 3.

Abbreviations

— AC: alternating current, designation for alternating current
— DC: direct current, designation for direct current
— U: voltage in volts [V]
— I: current strength in milliamps [mA]
— P: power in watts [W]
— E: energy in kilowatt hours [kWh]
— F: frequency in Hertz [Hz]
— R: resistance in kiloohms [kOhm]
— T: counting unit in points [digits]
— AIn: counting unit in points [digits]
— Time: details in seconds [sec] since the inverter was put into operation

8.5 End data transfer to a solar portal

You can end an activated data transfer to a solar portal at any time.

- Open the setting page of the web server.
- Click the box next to the name of the portal to deactivate the data export to the solar portal (☐).
- Click "accept" to apply and save the settings.

Note: To activate the data transfer, see chapter 6.2.4 (page 43).

9 Appendix

9.1 Technical data

	Unit	PIKO 3.0	PIKO 3.6	PIKO 4.2	PIKO 5.5	PIKO 8.3	PIKO 10.1
Input side (DC part)							
Max. DC output	W	3200	3800	4400	5800	8700	11000
Nominal DC output	W	2950	3450	4000	5250	8000	9650
Number of DC inputs/MPP trackers		1 / 1	2 / 2	2 / 2	3 / 3	2 / 2	3 / 3
Input voltage range	V	180…950	180…950	180…950	180…950	180…950	180…950
Rated input voltage	V	680	680	680	680	680	680
Min. MPP voltage $U_{MPP\ min}$ with DC rated output in symmetrical multi-string, dual-tracker or parallel operation	V	380	340	360	360	400	420
Min. MPP voltage $U_{MPP\ min}$ with DC rated output in single-tracker operation	V	380	440	500	660	Not appropriate	Not appropriate
Max. MPP voltage $U_{MPP\ max}$ with DC rated output	V	850	850	850	850	850	850
Extended MPP voltage range with partial inverter output, depending on the mode of operation	V	180 to $U_{MPP\ min}$	180 to $U_{MPP\ min}$	180 to $U_{MPP\ min}$	180 to $U_{MPP\ min}$	180 to $U_{MPP\ min}$	180 to $U_{MPP\ min}$
Max. DC output ratio for transmission in extended MPP voltage range[1)]	%	Approx. 70	Approx. 70	Approx. 70	Approx. 70	Approx. 70	Approx. 70
Max. DC input current/parallel connection	A	9 / —	9 / 13	9 / 13	9 / —	12,5 / 25	12,5 / 25
Output side (AC part)							
AC nominal rating	W	2800	3300	3800	5000	7600	10000
Max. AC output	W	3000	3600	4200	5500	8300	10000
AC nominal current (per phase)	A	12.2	14.4	5.5	7.3	11	13.3
Max. AC current (per phase)	A	13.1	15.7	6.1	8	12	14.5
Consumption							
Stand-by consumption	W	< 1	< 1	< 1	< 1	< 1	< 1
Nighttime consumption	W	< 1	< 1	< 1	< 1	< 1	< 1
Degree of efficiency							
DC switch-on voltage	V	180	180	180	180	180	180
Feed-in from	W	25	25	25	25	40	40
Max. efficiency	%	94.8	94.9	96.0	95.3	96.0	96.0
European efficiency rate	%	93.6	94.0	94.7	94.2	95.3	95.4
MPP adaptation efficiency (static)	%	99.9	99.9	99.9	99.9	99.9	99.9

Table 16: *Technical data*

1) In addition to the nominal MPP voltage range, the PIKO inverters also feature an extended MPP voltage range, which can also absorb particularly low module voltage and partial output from PV generators, which e. g. were caused by architectural divisions. In this range, the MPP tracker can be operated at max. 70 % of its nominal DC output. Higher output in this lower MPP voltage range can lead to thermal limitation of the inverter.

9 Appendix

	Unit	PIKO					
		3.0	3.6	4.2	5.5	8.3	10.1
Safety							
Monitoring		Via automatic disconnection device with single-phase or 3-phase grid monitoring (according to DIN VDE 0126-1-1:2006-02)					
Protection class		Protection class 1					
Type of protection		IP 55					
DC reverse polarity protection		Yes (through short circuit diode)					
Ground monitoring		Yes					
Insulation monitoring		Yes					
Operator protection		Universal current sensitive residual current monitoring I > 30 mA ensures additional operator protection					
System data							
Feed-in		Single-phase		3-phase			
Conversion principle		Transformer-less					
Overvoltage category		III					
All-pole isolator		Grid relay, double construction					
Ambient temperature	°C	–20…+60					
Relative humidity	%	0…95					
CE conformity		EN 50178, EN 61000-3-2, EN 61000-6-2/3					
Cooling		Fan					
Weight (approx.)	kg	19.8	20	20.5	21.1	33	34
Dimensions (W × H × D)	mm	420 × 350 × 211				520 × 450 × 230	
Communication							
Communication interfaces		Ethernet (RJ45), RS485, S0, modem (analogue or GSM, available as accessory)					
Energy data		Pulse output 2000 pulses/kWh					
Data memory		Integrated					
Data display		integrated into the device and accessible via a standard Internet browser (HTML pages); extended data visualisation using PIKO Master Control software, which is available free of charge					

Table 16: *Technical data* (cont.)

9.2 Block diagram

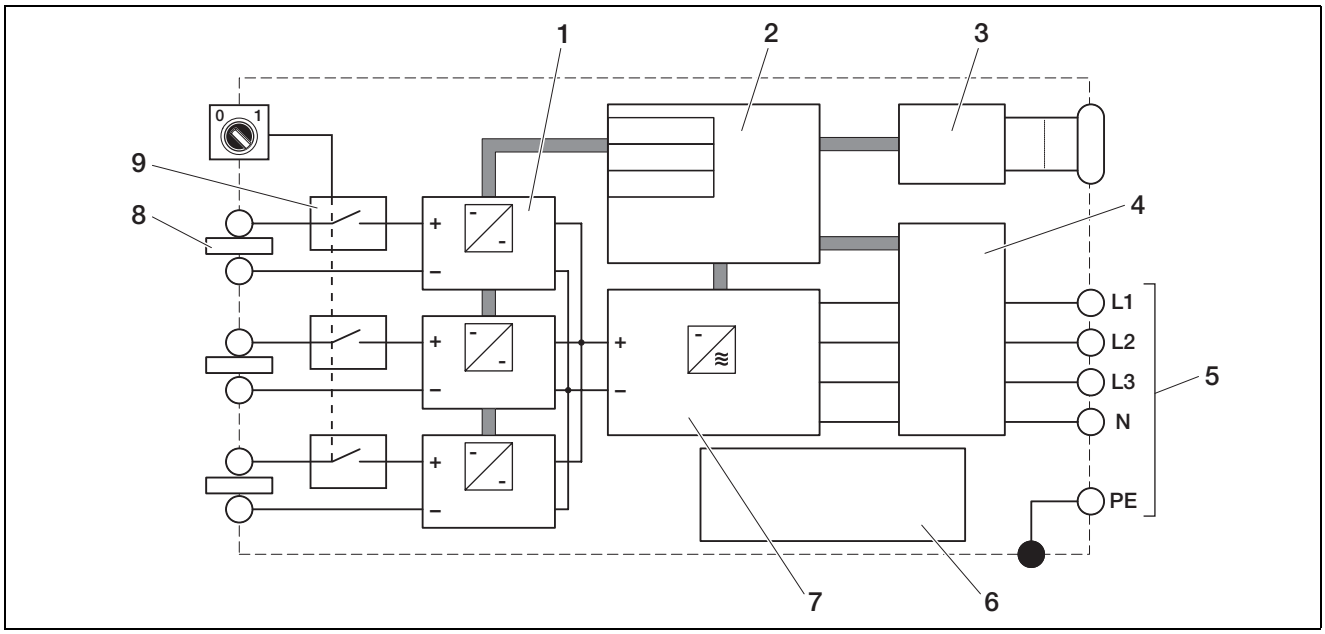


Fig. 88: *Block diagram (illustration shows* PIKO *10.1)*

1 DC regulator (1 to 3, depending on model)
2 System control with MPP trackers
3 Display and communication
4 Grid monitoring and shutdown
5 3-phase AC output
(for PIKO *3.0/3.6 single-phase: L / N / PE)*
6 Power supply unit
7 Inverter bridge
8 PV string (1 to 3, depending on model)
9 Electronic DC load break switch

9.3 Type plate

The type plate is located on the right side of the inverter. You will find the device type and the most important technical data listed on the type plate.

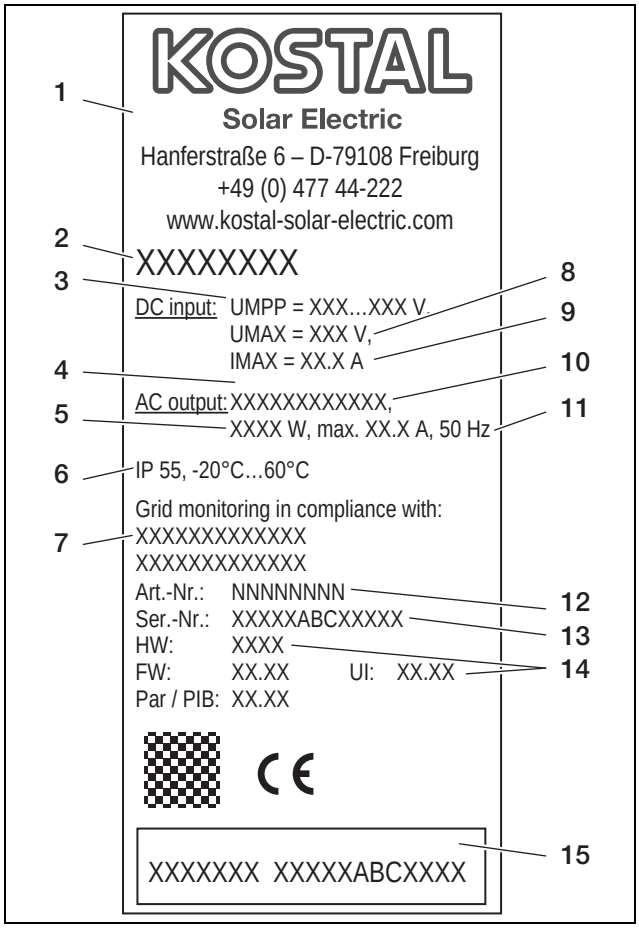


Fig. 89: *Type plate (example)*

1 Name and address of manufacturer
2 Device type
3 MPP control range
4 Number of feed-in phases
5 Maximum AC power
6 Protection type and ambient temperature range
7 Requirements conforming to those of the built-in grid monitoring
8 Maximum input voltage DC
9 Maximum DC input current
10 Output voltage (nominal)
11 Frequency (nominal)
12 Item number
13 Serial number
14 Version number of device hardware, software and user interface
15 Removable warranty label

9.4 Warranty and service information

Information on the warranty can be found in the warranty conditions, which are included separately.

Do you have any technical questions regarding your inverter? Our hotline +49 761 477 44 - 222 is on hand to assist.

For service information and a possible shipment of parts, we require your device type and the serial number. You will find this information on the type plate on the exterior of the housing.

If parts are required, use only genuine replacement parts.

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